THE

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N. S. DAVIS, M.D., EDITOR.

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Original Contributions.

ARTICLE XXXI.

PROF. MAHLA'S REPORT ON THE CHICAGO RIVER.

To the Committee of Aldermen, appointed for the Investigation of the Sources of Impurity in Chicago River:

GENTLEMEN:—I have the honor to present to you herewith the result of a chemical investigation, instituted at your request, with a view to trace the impurity of the Chicago River to its cause or causes. Difficult as this task is by itself, its complication has been considerably increased by certain circumstances beyond our control. Nevertheless, I trust that certain facts, exhibited by the accompanying table, will prove satisfactory to the members of the Common Council, and the public in general, where to locate the source of these impurities.

The odorous bodies which proceed from the Chicago River water are products of the decay and decomposition of animal and vegetable matter. Amongst them we recognize ammonia, sulphuretted and phosphuretted hydrogen, light carburetted hydrogen (marsh gas,) and scores of others, which are either of minor importance, or are summed up under the mysterious name "miasmatic effluvia."

The above-named combinations are produced in variable proportions, ammonia being the most prominent and important amongst them. This substance is generated always when ani-

mal or vegetable azotized materials are undergoing putrefaction or decay. It is a well-known fact that animal refuse matters are rich in nitrogen, and so is the vegetable refuse produced in distilleries, and known there under the peculiar term of "slop" or "swill." It is evident, therefore, that the slaughter and feeding houses, the tanneries, distilleries, and glue factories, if throwing such refuse matter into the River, admix to it ingredients that are rapidly redissolving their constituents into simpler compounds, *one of which is ammonia.* It need hardly be remarked here that the same body is contained in sewage, and that it is generated in considerable quantities by the dry distillation of coal. In so far now as this compound, ammonia, admits of a very accurate determination, I directed my attention entirely to it, disregarding fully the inorganic mineral constituents, because they cannot, under any circumstances, take an active part in the production of odorous bodies.

The small amount of current existing in the Chicago River is controlled almost entirely by the influence of winds. It is a fact well known to any one who pays attention to it, that a north or northeast wind makes the water rise in our River, whilst a southern or southeastern makes it fall. With other words, a northerly wind produces an upward, while a south wind causes a downward current. An east wind has rather the former effect, while a west wind drives it more or less outwards. If the wind be not very strong, all these movements are but slight and slow, and hence it is true that the Chicago River is more or less stagnant, in so far as the supply of fresh water from its origin is not very abundant. In consequence of these facts, any impurities emptied into the River remain in it for considerable time, or are, under a favorable wind, slowly driven into the Lake. The decomposition of animal and vegetable substances begins almost at the very spot where they mix with the River, or, if odorous principles in free state are admixed to it, they are found not far from their place of production in *larger* proportion than in others.

These considerations evidently point out the course of investigation. An accurate determination of the quantity of ammonia

in different parts of the River must fairly indicate a rapid increase of deteriorating substances, and must lead to the discovery of the parties by whom nuisances are produced. It was, however, absolutely necessary, in order to obtain reliable results, to collect the water only when the current of the River was downward, and in so far as this is controlled by the direction of winds, this had to be borne in mind.

The impossibility of collecting the different specimens of water for the purpose of a chemical analysis, at once, is obvious. The materials which are producing ammonia are subject to such rapid changes, that it was deemed advisable not to collect more specimens of water than could be analyzed within a reasonable time. To establish, however, a ratio between the various samples, I collected with every new series a specimen of water from a locality which had been analyzed at a previous time. Every rain had a certain bearing on the condition of the water—a fact which is fully demonstrated by the data given in the subjoined table. A heavy rain had made its appearance just one day before the first specimens of water were collected. As it takes, however, four or five days before the rain water flows into the River, it is easily intelligible that an amelioration in the condition of the water can be observed only after the lapse of such a time. The inference referred to can be appreciated by glancing at columns II, III, IV, V, and comparing the results obtained from the specimens 1, 2, 3, 4, 5 with 7, 8, 9, etc., also 10 with 17.

As a general thing, it was found that the specimens of water taken from the South Branch were purer than those from the North Branch of the River, (compare 17 with 18 and 19; also, 27 and 28 with 29 and 30, and 31.) This is undoubtedly due to the fresh water with which that Branch is supplied from the Desplaines River, but still more so from the Canal. By descending the River, it is found that the first rapid increase in the quantity of ammonia takes place between Van Buren and Madison streets, or rather in the vicinity of Monroe street, (compare 8 with 9; also, 12 with 13, 14, 15, and 16.) The amount of ammonia increases slowly by going down into the main River,

and reaches its maximum between Rush and Clark streets. The first specimen of water from the North Branch was taken far above all factories, at a locality where it would be supposed that the River water contained both organic constituents, and especially ammonia in no larger proportions than they would be found in ordinary River water. (See 18.)

Descending the North Branch from that place, it can be seen that the deteriorating materials commence increasing at Clybourne avenue, (below Nickerson's and above Wicker & Co.'s; compare 18 and 19.) The condition of the River becomes, however, rapidly worse between Clybourne and North avenues, (compare 19 with 20.) The same is observed between the latter place, Division street, and Chicago avenue, (compare 29, 30, and 31.) From there, however, to Indiana street, the ammonia augments in no greater proportion than would be attributed to natural causes, (compare 21 and 22.) A river being the drain of a country or a town through which it flows, must of course dissolve all the impurities which enter it in its course.

These same observations can be made by every layman, simply by testing for sulphuretted hydrogen. This combination is not contained in free state in the River water, but united with ammonia. Lead-paper, when held over the surface of the River water contained in a half-gallon bottle, is not affected, provided the specimen be not taken from the immediate neighborhood of a sewer. It is discolored, however, rapidly, if a few drachms of concentrated sulphuric acid are added. This substance not only liberates that body, but heats the River water sufficiently to disengage the gas. The rapidity with which the discoloration is effected, and the darkness of the paper, will give at least an idea as to the impregnation of the water with that body. It is obvious, however, that such a proceeding cannot serve for any *accurate* determinations. The fact now that the North Branch of the River is lined, above Chicago avenue, with distilleries, tanneries, slaughter-houses, stables, and hog-pens, (in some of which more than 1000 head are kept,) explains the results obtained by chemical analysis. The urine, mixed with the *fæces* of the pigs and cattle kept in those stables, is poured into the

River. Occasionally the slop of the distilleries runs over and is added, with the blood of the slaughter-houses, to the decaying substances. Under such circumstances, what else could be expected than the commencement of a rapid decomposition, started by the action of numerous bodies, all of which are already engaged in the same process? And is it to be wondered that the water of the North Branch is *almost as impure as that taken from one of our most important sewers?* (Compare 29, 30, 31, with 34, 35, 36.

Another observation which was made in the course of these investigations is the following:

Copious masses of gas rise to the surface of the river water between Clybourne avenue and Division street, especially, however, in the neighborhood of the Chicago Distillery Co. (Rawson & Streeter.) This takes place in such proportions that—to use the language of the people living there—the River boils. This gas was found to be a mixture of carbonic acid and light carburetted hydrogen (marsh-gas.)

The water of the North Branch is always darker than that of the South Branch of the River, provided the River be in its natural condition, undisturbed by the pumping operations of the Illinois and Michigan Canal at Bridgeport, or cleaned out by heavy rains. This difference in color was especially remarkable during the last eight days, and reached such a degree that the first one appeared almost black when compared with the other. A great deal of curiosity has been manifested by the public as to the probable cause of this black color. In my opinion, it is a natural consequence of the decay of vegetable substances, and readily intelligible. The slop of distilleries consists of a variety of substances, some of which are of great value for fattening cattle, and are used by several parties for that purpose. The cellulose, however, which is an important item of the constituents of slop, is indigestible, and passes off unaltered with the *fæces*. This cellulose now is the material, which, by its decay, produces, at a certain period, the black body, which, when suspended in the water, imparts to the latter its remarkable black color. In order to explain my views, I am forced here to call

an analogous fact to remembrance—the formation of coal. I do not mean that coal formation which took place in the earliest periods of the earth, but one which is still progressing. KNAPP says, in this respect, in his excellent work on chemical technology: "It would be going too far, if we would deny the continuous formation of coal, even at the present time. The large rivers of the American continent carry often numbers of trees away, which become heavier the more they are soaked with water, and sink finally to the ground. There they are covered with mud, and undergo a slow process of decay. Such trees are converted, after some time, into brown coal. A similar process is the formation of peat, and, I hold, that the formation of the black body in our River is an analogous fact. Let us call this product, formed from cellulose, ulminic acid; or let us denominate it otherwise. The fact is, it is a derivitive which is richer in carbon than the original cellulose, and formed from it. If we compare the composition of cellulose with that of brown coal or ulminic acid, we will readily find that the latter two are richer in carbon than the first; and it is now generally assumed that this change is produced by the elimination of oxygen and hydrogen, with a little carbon in the form of carbonic acid, marsh-gas and water.

Cellulose = $C^{24}\ H^{20}\ O^{20}$

If we subtract: 8 equiv. water, = $H^8\ O^8$
5 equiv. carb. acid, $C^5\ O^{10}$ } = $C^{10}\ H^{18}\ O^{18}$
5 equiv. marsh gas, $C^5\ H^{10}$

we obtain in the following, viz.:— $C^{14}\ H^2\ O^2$

the formula of a body that is very similar in its composition to certain varieties of brown coal. Or,

1 equiv. cellulose, = $C^{24}\ H^{20}\ O^{20}$

decomposes into

1 equiv. ulminic acid = $C^{20}\ H^6\ O^6$
2 equiv. carbonic acid = $C^2\ O^4$
2 equiv. carburetted hydrog. = $C^2\ H^4$
10 equiv. water = $H^{10}\ O^{10}$
} = $C^{24}\ H^{20}\ O^{20}$

This argument seems to be substantiated by the observation that both carbonic acid and marsh-gas are evolved in such copious masses from the bottom of the River, (as stated above,) and

that the black color begins just below the still-houses and stables.

Thus it appears that the largest portion of the River nuisance is generated on the North Branch, and it must be borne in mind that *not a single sewer* empties into that part of the River.

It cannot be disputed, however, that the sewers themselves give rise to a certain portion of the odorous effluvia, and will do this in a still greater measure in the course of time, (a thing which was foreseen by our able Chief Engineer, Mr. E. S. CHEESEBROUGH, and mentioned by him in his report as early as 1855.) But considering that the sewers, which are of importance, are emptying their liquids into the Main Branch of the River, so that the sewage has but a short distance to flow until it mixes with Lake water, and is largely diluted with it. I do not believe that their effects are for the present specially noxious.

It may be stated here that all the sewers south of Madison street, with the exception of a single one, are of not much importance, and that the sewage contained in them is but little richer in ammonia than the River water itself. The single sewer, however, to which I have made reference is the Monroe street sewer. The liquid contained in it is very rich in ammonia, (compare 32); contains coaltar-creosote (carbolic acid), and exhales copious quantities of sulphuretted hydrogen; a lead-paper held in a distance of four or five feet from the surface of the water is blackened almost immediately, provided that the current has a riverward direction. The discoloration of lead-paper is effected in a much slighter degree by the sewage of other sewers.

Admixed to the liquid discharged by the Monroe street sewer are tarry substances, which have accumulated in the River to such an extent that its whole bed seems to be covered with it, for every steam tug wheeling up the water makes a portion of tar rise to the surface. The presence of these tarry substances can be traced from Adams street to Rush street bridge. Sulphuric ether agitated with the water extracts them readily; they may be separated from the ethereal solution by a subsequent spontaneous evaporation.

It appears from the tables, that the sewage contained in the Rush street sewer is less charged with ammonia than other sewers, (compare 33, 34, 35, 36.) This may look strange to some, as it is known that the greatest number of privies are connected with it. The water in this sewer is in a condition perfectly different from others. It is hot, (heated by the condensing waters of the pumping works and breweries,) and hence less apt to hold gaseous bodies in solution. Ammonia and its associates of miasmatic effluvia are, therefore, sent into the air as soon as generated. Hence this sewer becomes often very offensive to the inhabitants of the street, much more so than Randolph street sewer to the inhabitants of that street.

From the above, it may be seen that, 1st. The greatest portion of the impurities which give rise to putrid effluvia enter into the North Branch of the Chicago River; that the urine, fæces, etc., fed on the swill of the still-houses, by being allowed to flow into this Branch, are the most direct causes of noxious exhalations; that certain distilleries, in allowing portions of the swill to run into the River, contribute also their share to them.

2. The Monroe street sewer discharges into the River a liquid which contains odorous substances that are usually produced in gas factories, which are more disagreeable than noxious.

3. The city sewers alone are not yet of sufficient importance to create serious trouble, but will do so undoubtedly in the course of time.

4. The slaughter and packing-houses on the South Branch, cannot be blamed *at present*, (compare 3, 4, 5,)—a conclusion which may be inferred from the fact that they are not, and have not, been working for several months previous to the commencement of this investigation. The question whether they do throw waste materials into the River, when working, can be settled only in spring-time, after the River ice has given way.

It is undoubtedly a matter of great importance how the existing nuisances can be abated. I cannot omit, however, to make here the remark, that not all the odorous effluvia are sent forth by the Chicago River. The packing and slaughter-house owners are at present not doing anything which is objectionable or de-

teriorating our River water. But, if my information is correct, they leave large quantities of refuse matter in certain places near by, where they undergo putrefaction. The odor in the vicinity of such establishments is unbearable; and, I ask now, is the stench by which Bridgeport is infested, and which can be observed during a favorable wind, even in our city business streets, less objectionable because it proceeds directly from the soil on which the animal refuse is thrown, and does not emanate from the River water? Are the gaseous bodies generated by the putrefaction process less noxious in the first than in the latter case?

I should propose that these men, instead of throwing a valuable azotized compound away, should use it up *for the production of saltpetre*, which is an article commanding invariably a certain price, that would not only cover expenses, but secure a handsome profit. The same might be done by the owners of the stables and piggeries with the urine and manure. The gas factory, however, instead of pouring the wash-water into the River, could use them for the *production of ammoniacal salts*, a thing which is done in most of the European cities, with a great deal of advantage. By doing so, the offensive sulphuretted hydrogen could be got rid of in a more complete manner than by using dry lime purifiers.

In conclusion, I wish to state that the determinations of ammonia were made by volumetric analysis, principally following Mr. BOUSSINGAULT'S plan, and adopted by him in the determination of that body in rain, snow, river, and spring waters, (*Annales de chimie et Phys.* xxxix, page 257; also, *Mohr's Hand-Book der Titrir methode*, page 77.)

No. of specimen of water.	Date of Collection.	Where Collected.	I. Wind.	II. Rain, inch's.	III. Organic constituents.	IV. Ammonia in 100.000 p'rts.	V. Ratio of Ammonia in the diff'rent sp'm's.
		SOUTH BRANCH.					
1	July 22	Above Wahl's glue factory,	s	.....	0.56726	.....	.....
2	" 23	Archer road bridge,	w	.....	0.51343	.....	.....
3	" 23	Opposite Hancock's packing house,	w	.....	0.40944	0.216720	998
4	" 23	Halsted street bridge,	w	.....	0.41474	0.217152	1000
5	" 23	Twelfth street bridge,	w	.....	0.41804	0.282168	1299
6	" 23	Clark street bridge,	n w	.....	0.70440	.....	.....
7	" 27	Twelfth street bridge,	e s e	.....	0.36202	0.108180	1299
8	" 27	Polk street bridge,	e s e	.....	0.36632	0.125280	1504
9	" 27	Madison street bridge,	e s e	.....	0.38071	0.223200	2680
10	" 29	Halsted street bridge,	e s e	.....	0.36704	0.146844	1000
11	" 29	Twelfth street bridge,	e s e	.....	0.37208	0.190800	1299
12	" 29	Van Buren street bridge,	e s e	.....	0.39693	0.233460	1589
13	" 29	Opposite Monroe street, middle of River,	e s e	.....	0.40283	0.276948	1885
14	Augt. 1	Twelfth street bridge,	w	.....	0.38622	0.244764	1299
15	" 1	Dock, just south of Monroe,	w	.....	0.43600	0.417384	2211
16	" 1	Randolph street bridge,	w	.....	0.57538	0.419868	2228
	" 6			7			

No. of specimen of water.	Date of collection.	Where Collected.	I. Wind.	II. Rain inches.	III. Organic constituents.	IV. Ammonia in 100.000 parts.	V. Ratio of ammonia in diff'rent specm's
		NORTH BRANCH.					
17	Augt. 8	Halsted street bridge, South Branch, for comparison,	s	.....	0.04805	0.10000	1000
18	" 8	Bridge opp. Faber's bone black factory, almost a mile n. of RR. crossing & Nicker's.	s	.....	0.05010	0.09945	993
19	" 8	Clybourne ave. bridge, below Nickerson's, and above Wicker & Co.'s distillery,	s	.....	0.06571	0.11475	1146
20	" 8	North avenue, below Rawson & Streeter's,	s	.....	0.06982	0.19125	1911
21	" 8	Chicago avenue bridge,	s	.....	0.08338	0.23290	2327
22	" 8	Indiana street bridge,	s	.....	0.08625	0.25583	2556
	" 9			1¾			
23	" 10	Above foot of Franklin street,	s w	.....	0.055037	0.25670	.....
24	" 10	Below Clark street bridge,	s w	.....	0.066538	0.30600	.....
25	" 10	Below Rush street bridge,	s w	.....	0.066948	0.34425	.....
26	" 22	Halsted street bridge,	s w	.....	.....	0.1728	1000
27	" 22	Van Buren street bridge,	s w	.....	.....	0.2754	1593
28	" 22	Madison street bridge,	s w	.....	.....	0.3870	2254
29	" 22	Chicago avenue bridge,	s w	.....	.....	1.3243	7663
30	" 22	Division street,	s w	.....	.....	1.3022	7535
31	" 22	North avenue bridge,	s w	.....	.....	1.1526	6670
32	" 22	Monroe street bridge,	s w	.....	.....	2.7200	15740
33	" 22	Randolph street sewer of South side,	s w	.....	.....	2.6112	15111
34	" 22	Randolph street sewer of West side,	s w	.....	.....	1.0670	6178
35	" 22	Clark street sewer of North side,	s w	.....	.....	1.4502	8392
36	" 22	Rush street sewer of North side,	s w	.....	.....	0.7199	4166

EXPLANATION OF THE TABLE.

Column I. shows the direction of the wind at the time of collection.

Column II. shows the quantity of rain fallen within 24 hours on the square foot of surface—expressed in inches.

Column III. exhibits the proportion of organic matter in several specimens of water.

Column IV. gives the actual quantity of ammonia in 100.000 parts.

Column V. exhibits the ratio of ammonia in the different samples of water. In comparing the various specimens, I had to assume one of them as unity, which I did by giving to the water collected at Halsted street bridge the round cipher 1000. The fractional numbers exhibited in column IV. were assumed as whole numbers, and all of them reduced to the standard of Halsted street—1000.

The titre solutions used by me were, however, only one-tenth of the normal strength, thus making the test more delicate.

The organic matter was determined by normal solution of mineral chameleon, under addition of some cont. sulphuric acid. The number of cubic centimeters used were reduced to oxalic acid. It was assumed that the reaction was ended when the rose color lasted for a period of five minutes. Though this method is very dispatching, and for the present purpose immensely preferable to the old mode of incinerating the dry residue of a given quantity of water, it is evident that the direct quantities of organic matter are not found by it. *All that is found is the proportion* of organic constituents in various specimens of water. The foregoing results are all that can be ascertained by an investigation at this season of the year. The additional effects produced upon the water by the refuse of slaughter and packing-houses can only be known in spring-time.

ARTICLE XXXII.

MEMPHIS, TENN., *Oct.* 21, 1862.

MESSRS. EDITORS:—Sickness at sometimes, and excess of duties at others, have prevented me from making my usual reports to you of late, concerning army medical matters. The most recent surgical information which I can present is that of the Battle of Corinth.

Orders were there given to amputate no thigh above the middle, without a full council, and then only in desperate emergency. This order was given in consequence of the horrible mortality of high amputations. The result was strikingly, but

perhaps fallaciously, brilliant. Of all the thighs amputated below, or at the middle, four-fifths were alive *and doing finely*, on the tenth day, when last heard from. This was among the Union troops. Among the wounded Secesh, who fell into our hands, the same rule was adopted, but the result was exactly reversed. *Four-fifths of similar cases among them died before the tenth day.* This difference in the two classes is due, I believe, to two causes: 1st. The Confederate troops were nearly in a state of starvation, many of them having only roasted green corn in their haversacks. 2d. It is probable that many of the most favorable cases for the operation contrived to crawl away and get carried off on the retreat. There may also be a natural difference in their power of endurance, for it is noticeable through this whole region that the inhabitants have a sallow, thin appearance, which contrasts strongly with the ruddy robustness of our soldiers. In most parts of this region, a ruddy native is a wonder, and a fat one could not be found at all.

Some inquiries into the fate of the compound fracture of the femer above the middle, which by the above rule were excluded from amputation, lead me to doubt the wisdom of the order. They were simply put into the easiest position possible, and kept under expectant treatment only. The result was, that *they all died.* Now, the results of high amputations are frightful, being 80 per cent of deaths; but I submit that even that is better than the death of the whole, as shown under this order. I am inclined to think, from some cases which have fallen under my observation, that gunshot wounds fracturing the femur in the upper fifth, where it consists of cancellar tissue, are less fatal than those of the shaft. At least, one officer whom I treated in such a case with splints made a good recovery.

On the whole, the important question of what shall be done with gunshot compound fractures resolves itself, according to my military experience, as follows:

In the upper half of the femur, dress with extension splints, and, if necessary, make early and free incisions, but do not amputate if it can be avoided.

In the lower half or at the knee-joint amputate or resect.

In the leg, if the knee is perfect, try to save the limb, except in very bad cases.

In the arm and forearm go all lengths to save the limb. Resections are very successful in every part of the superior extremities.

If the shaft of a long bone is shattered by a bullet, and amputation is not performed, free incisions are usually required, either immediately or after the third day. The bullet hole is apt to close, or be blocked with shreds of flesh; the pus is confined, and burrows horribly up and down among the muscles, and forms so large a suppurating cavity that the patient succumbs from exhaustion. A large proportion of the patients, however, die of prostration before suppuration commences.

The health of the army here has been excellent. Among 9000 men, in the month of September, the sickliest of the year, the deaths were only 47. About 300 are in hospitals, and 500 slight cases receive medical attention in quarters. The deaths are only about 1 per cent of all the cases which come under treatment.

Dysenteries have not been severe, as a general rule. I have had about 150 cases in the artillery, since entering the service, and not a single one has died. I lost a few patients of chronic diarrhœa, but none of the acute forms. There has been no cholera or yellow fever in camp, and only a few cases of congestive chills.

There are about 1400 contrabands here, at work upon the fortifications. About 1 or 2 per cent of them have pistol wounds, received in escaping from their masters. Of course, the severer cases do not reach here; hence we see a good many moderate wounds among them. One of them was shot through the lungs and in the hand, and had some fifty dog bites on his legs, and a spot beaten raw on his back, of the size of a dinner plate. I tried to save him, but he died of his injuries, on the third day after he came in. Two days ago, the guerillas shot a negro in sight of the fort on the opposite side of the river, and left his body unburied on the sand. Our soldiers went over and interred it. The barbarities of this sort, which have fallen under my

notice, have constituted more than half my surgery, for the last two months. The skirmishes with the enemy in this vicinity, result mostly in buckshot wounds upon our soldiers, which are of no great severity. One case, however, where the shot was made close at hand, sent a projectile into the brain, of which the patient died in about five days.

The foolhardiness of some men is amazing. At Fort Randolph, I saw three officers take a loose torch and explore an old subterranean rebel magazine, where were scores of charged shells lying about, and the torch dropping fire among them. An artillery soldier came to me with a wounded hand. He had been trying to burn out the fuze of an old rebel shell with a red hot poker. The success of his interesting experiment astounded him.

The negroes at work upon the fortifications have about the same proportion of sick as the soldiers, and exactly the same diseases, viz.: intermittents, remittents, diarrhœas, and dysenteries. I think the question of their capacity to tolerate climatic influences may be answered thus: they endure the heat of summer with more comfort than the whites, but are not a particle more exempt from malarious diseases. My observations here confirm those of Dr. CARTWRIGHT, of New Orleans, in that respect. In cases of dysentery, I think they succumb to the disease more quickly than the whites.

The Surgeon-General has commenced a pathological cabinet at Washington, and ordered all specimens collected in the army to be forwarded. It is a worthy object, and may be the means of throwing great light on some points of surgery, especially the effects of projectiles upon the long bones.

I trust I shall be with you to resume my lectures in Lind University, this winter. Yours truly, E. ANDREWS.

Surgeon of 1st Ill. Light Artillery.

ARTICLE XXXIII.

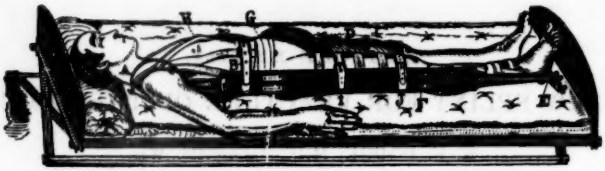
A NEW SPLINT FOR FRACTURE OF THE FEMUR.

E. F. DODGE, M.D., Janesville, Wis.

MESSRS. EDITORS OF THE EXAMINER:—During the course of lectures by Prof. ANDREWS of 1861-2, in the Medical Department of Lind University, he exhibited and explained the application of a rude splint, by which both extension and counter-extension could be made by the use of adhesive plaster in all cases of fracture of the femur and leg; doing away with the perineal band, so long used and revered by all of the disciples of Æsculapius, except Dr. GILBERT, who used the adhesive plasters in fractures of the femur and leg, but in such a manner as to amount to the same thing as the perineal band. (See description of GILBERT'S apparatus, in Prof. HAMILTON'S work on *Fractures and Dislocations*, page 420.)

It will be noticed, from a slight examination of the accompanying cut, that this splint is so constructed as to entirely do away with the perineal band, or even a semblance of it, and, at the same time, affording a secure, perfect, and reliable counter-extension, without any of the objections so strongly and justly urged against all other methods, such as excoriation and ulceration of the perineum and axilla, pressure upon the obturator, crural, and axillary nerves, loosening of dressings by the patient, etc., etc. The apparatus also combines all the advantage gained by the weight and pully, as well as the fixed dressing of DESAULT.

I think that this splint entirely and satisfactorily fills a desideratum long admitted to exist in the treatment of fractured femurs, no matter in what part of the bone occurring. Also, that shortening, and all other deformities heretofore resulting from the most carefully and judiciously applied apparatus, is fully obviated by the instrument now invented, which completely overcomes all the difficulties encountered in the treatment of these fractures.



The following description of the cut will aid the surgeon in constructing and applying the splint:—

The steel spring A, passing from the small bar C, to the point of the shoulder, should be made in such a manner as to have all the spring between the centre of the bow and the hook, and of such strength as to yield from one-half to three-fourths of an inch on the application of from three to five pounds weight.

By the use of this spring we get constant and steady traction upon the muscles, which overcomes their contractility, and the limb is kept extended to its proper length, without any trouble, and with but very little traction.

The main bar F, is three inches wide, five-eighths of an inch in thickness, and twenty-eight inches long, either end of which is grooved for the reception of the two smaller bars C and E, which can be adjusted by means of the set screw C, and the extending screw E, so that the apparatus may be used for the longest or shortest patient. The two smaller bars are one and a-half inches wide, and three-eighths of an inch thick. The extending bar E, is eighteen inches long, and the counter-extending bar C, is fourteen inches long.

To the inferior extremity of the extending bar E, is attached a cross-bar, to which is attached a foot piece, and a portion of the screw-extending apparatus. By the means of the thumb-screw E, extension may be made at any time, without removing any of the dressings or disturbing the limb in the least. The oblique counter-extending adhesive plaster H, commences at the middle of the crest of the ilium, and extends obliquely across the chest anteriorly to the shoulder, then obliquely downwards and backwards to the point of commencement, (the middle of the crest of the ilium.)

The cut exhibits another counter-extending adhesive plaster (which by mistake was not lettered,) that commences a little internal to the middle of the crest of the ilium of the injured side, and extends upward to the shoulder of the same side, then downward on the dorsal aspect of the chest, to a point opposite the place of commencement.

G, adhesive plaster passing quite around the body, covering the ends of the plasters H and the one not lettered, binding them firmly to the surface, which prevents their slipping when extension is applied.

The counter-extending plasters should be from one to three inches in width, according to the size and strength of the patient, or according to the amount of force necessary to be used in keeping the limb properly extended. The extension is made by adhesive plasters in the ordinary manner.

B, I, and J, are straps of webbing, which are made fast to the main bar, and are buckled around the limbs and body.

In cases of compound fractures, this apparatus may be modified, so that the wound may be dressed without removing the splint, by cutting out a section of the main bar, and riviting strong pieces of iron to each piece, which may be bent in such a manner as to leave the wound exposed.

The apparatus here described was used by Dr. TREAT and myself, in a case of oblique fracture of the femur, occurring in the lower half of the lower third of the bone.

The limb was dressed in the ordinary manner, with short splints, to keep the ends of the fractured bone in perfect opposition. The cure was perfectly satisfactory to both patient and attendants. The unfortunate member is quite as long as its more fortunate fellow, and perfectly natural in its appearance, there being scarcely any callous.

The patient was a young man, 18 years of age, and of a rheumatic diathesis. Hence he complained some of rheumatic pains during the progress of reunion of the bone, but never found the least fault with the apparatus. The extension and counter-extension being borne as well the last as the first day of their application. There was not even the slightest abrasion

of the cuticle, notwithstanding the very hot weather during the period of his confinement, it being from the 13th of June to the 1st of August.

Indulging the hope that the profession will give this new method of treating fractures of the femur and leg a fair and impartial trial, I am confident that the suffering of the unfortunate ones will be infinitely diminished, and the success of the profession greatly augmented.

ARTICLE XXXIV.

GENERAL PATHOLOGY OF ERUPTIVE FEVERS, AND THE PRINCIPLES THAT SHOULD GOVERN THEIR TREATMENT.

Read to the Chicago Medical Society, Nov. 7, 1862.

By N. S. DAVIS, M.D., Professor of Clinical Medicine, &c.

The diseases directly alluded to, under the head of eruptive fevers, in this paper, are Variola, Rubeola, and Scarlatina. Their great relative importance is shown by the fact, that in England and this country, and probably throughout all the civilized countries, from *eight* to *ten* per cent of the entire mortality arises from these three diseases.

A glance at the statistics of mortality show another interesting fact, namely, that while one of these diseases is most prevalent and fatal one year, and another the next year, the annual aggregate mortality from them all remains nearly uniform. It also appears from the same statistical tables, that while the mortality from small-pox has been greatly diminished by the general practice of vaccination during the last half century, the mortality from scarlatina, rubeola, and hooping-cough has correspondingly increased, thereby maintaining the annual aggregate nearly the same. This has led Dr. GREGORY, and some others, to claim that there exists among the class of acute eruptive fevers a "law of compensation," or vicarious prevalence.

Aside from the intimate relation which the several eruptive fevers bear to each other, as shown by the statistics already alluded to, there are several interesting characteristics common to them all:—

1st. While they often occur epidemically they are all propagable by contagion.

2d. There is in the human species an almost universal susceptibility to these fevers. The most liberal estimates do not claim, as exempt from susceptibility, more than one in sixty of the entire population.

3d. While there is an almost universal susceptibility to each of the diseases under consideration, such susceptibility is permanently destroyed by a single attack. Hence it is very rare that the same individual is attacked twice by the same eruptive fever.

4th. Each of these diseases are not only self-limited in duration, but they present several well-defined stages or epochs: as the period of incubation, the promonitory fever, and the period of eruption.

These several characteristics plainly indicate the fact, that this class of diseases arise from exciting causes of a specific and uniform character; causes which are generally ranked as animal poisons, and capable of being reproduced in the body of the sick. They may be introduced into the system either by contact with the cutaneous surface, or by inhalation and absorption from the pulmonary mucous membrane.

When introduced into the blood by either of these methods, even in extremely minute quantity, no immediate appreciable effect is produced; but in a period varyiug from four to fourteen days, it becomes multiplied in the blood to such an extent as to disturb the susceptibility of all the organized structures of the body, thereby causing all the symptoms of an active irritative grade of general fever. That these poisons do thus effect the blood, and through it the properties of all the tissues, is demonstrated by the fact that inoculation with the blood of patients laboring under the active stage of rubeola and scarlatina, communicates the same disease to the persons inoculated. By

what process these poisons are multiplied in the blood during the period of incubation is not known. From an early period, it has been regarded as analagous to fermentation in vegetable matter. This idea was distinctly inculcated more that two hundred years ago, by SYDENHAM and DIEMERBROECK. In modern times, it has been revived and rendered somewhat popular by LIEBIG.

From the supposed analogy to the process of fermentation, the process of incubation in the eruptive fevers has been called *zymosis*, from the Greek word signifying *ferment;* and they have been styled *zymotic* diseases, by a large class of modern writers.

Whether there is any reality in the analogy here alluded to or not, it is quite certain that by some process the smallest quantity of variolous, rubeolous, or scarlatinous poison introduced into the blood undergoes such rapid and extensive multiplication as to induce, in a few days, a high grade of febrile excitement throughout the whole system. At the same time, it effects such a change, either in the composition of the blood or the susceptibility of the tissues, or both, as to destroy all influence of the same poison at any future period. In addition to the action of eruptive fever poisons on the susceptibility of the tissues generally, they all display a special affinity for the cutaneous structures, in which their presence induces more or less inflammation constituting the eruption. The affinity of those poisons which gives rise to the pustular form of eruption, as the variolous, is so strong as to cause their lodgement in the skin during the first four days of the febrile action, and their consequent removal from the mass of the circulating fluids. This causes simultaneously a subsidence of the general irritative febrile action, and the development of a local pustular inflammation at each point in the skin where the poison has been deposited. If all the poison is thus early removed from the blood, on the appearance of the eruption, the apyrexia becomes complete, and the patient remains free from fever until the intensity of the cutaneous inflammation renews more or less general febrile action. But if, as sometimes happens, some of the poison fails to be deposited in the skin and continues in the blood, the subsidence of the fever

will not be complete on the appearance of the eruption, but will continue with more or less severity, accompanied by progressive deterioration of the blood, and all those symptoms set forth by authors as characterizing the malignant form of variola.

The poisons producing the eruptive fevers of the exanthematous variety, such as rubeola and scarlatina, display a similar affinity for the skin, and in addition also for the mucous membrane of the fauces and larger bronchial tubes; exciting in these structures more or less inflammation of a specific character, but do not become deposited in these tissues to such an extent as to free the blood from their presence, or to relieve the other structures of the body from their irritating effects. Consequently, there is, in these diseases, no abatement of the febrile symptoms on the appearance of the rash or local imflammation in the skin. On the contrary, the fever continues in full severity until the eruption itself begins to decline. That the specific poison continues in the blood during the eruptive as well as premonitory stage, would seem to be demonstrated by the fact that these diseases can be communicated to healthy persons by inoculation with the *blood* of the sick. That it is finally expelled partly through the skin and partly through the kidneys, we have no doubt. That the latter organs take part in the process of expulsion of the poison, and consequently suffer much derangement of their function thereby, is countenanced by the fact that in a large proportion of cases, especially of scarlatina, the urine becomes albuminous during the progress of the disease. And dropsical effusions, produced by deficient and unnatural renal secretion, are well known to be among the most frequent sequalæ of these fevers.

With these explanations, we may sum up our views of the pathology of eruptive fevers as follows:—1st. There is an exaltation of the elementary susceptibility of the organized tissues of the body, with a perversion of vital affinity, as indicated by an active grade of irritative fever and disturbance of the great functions of circulation, secretion, innervation, and calorification.

2d. This general disturbance called *fever*, is the result of the

action of a poisonous material circulating in the blood, altering its properties, and consequently its relations to all the tissues; and, finally, manifesting a special affinity, first, for the skin, second, for the mucous membrane and glands of the fauces, and third, the kidneys.

3d. The special affinities here mentioned, cause an early lodgement of more or less of the poison in the cutaneous tissue, and the consequent development of specific inflammations in the form of exanthems, vesicles, or pustules. The affinity, especially of the scarlatina and rubeola poisons, for the mucous membrane and glands of the fauces, is scarcely less uniform; and owing to the greater vascularity of the structures, often results in the development of inflammation of far greater intensity and danger than that in the skin. Whether these poisons possess a special affinity for the structure of the kidneys, as indicated in the second proposition, or whether the irritation of those organs, resulting in scantiness of secretion, albuminous urine, and ultimate uremic poisoning or dropsical effusions, is simply the effect of an effort on the part of the secreting structure of the kidneys to eliminate the poison from the blood, we may not be able to determine.

4th. The more complete the lodgement and isolation of these poisons in the cutaneous texture, in the early stage of these diseases, the more mild will be all their subsequent progress. On the other hand, the less perfectly the poison becomes lodged in the skin in any given case, the more persistent will be the general febrile action, the more rapidly will the whole mass of the blood become impaired in its properties, and consequently the greater will be the danger of serious internal complications, or of the supervention of typhoid and malignant symptoms.

If the foregoing general summary is correct, or even proximately so, it affords a basis on which can be founded some important practical maxims for the treatment of this very important class of febrile diseases.

The first and most obvious indication to be fulfilled in the treatment, is the use of such remedies as will directly neutralize the poison in the blood, and thereby obviate most of its effects

upon the tissues. Unfortunately, we are not acquainted with any such available antidote. Belladonna, which has been much used both as a proplylactic and remedial agent, probably has no other effect than to lessen the susceptibility of the tissues, and to aid in determining to the cutaneous surface. Chlorine and the chlorates undoubtedly possess properties more nearly akin to antidotes or destroyers of these and other animal poisons.

We have used them for several years, in all stages of eruptive fevers, and generally with benefit.

Failing to neutralize the poison, the next object in the treatment is to mitigate its irritative action on the tissues, and to aid its natural tendency to the skin, either for lodgement or expulsion. For this purpose, the union of anodyne and diaphoretic properties are required, with a careful avoidance of all those active evacuents that would divert the circulation, and consequently the poison, to internal structures, and thereby directly counteract the natural tendency to relief. On this account, active cathartics are particularly objectionable in these fevers.

A third object in the treatment is to counteract local internal inflammation, whether in the throat, kidneys, or mucous surfaces; and to sustain, generally, the vital powers of the patient.

Selections.

ON THE ALKALOIDS OF HYDRASTIS CANADENSIS.

By WM. S. MERRILL, A.M.

To the Editor of the American Journal of Pharmacy:—

I hoped to be able to attend the approaching meeting of the American Pharmaceutical Association, but find I shall not be able to leave home. I have therefore forwarded to you a small package of samples, chiefly products obtained from the Hydrastis, and request you will present them to the Association for their examination.

In a business letter to Prof. Parrish, some months ago, I briefly mentioned these. I was not publishing an analysis or

writing an essay, but briefly stated the fuller results of our experiments, of which I had previously sent him some samples; and I expressed a willingness to have these statements published, as they contained some facts that I did not suppose had been previously announced. Under these circumstances, I certainly thought some portion of your criticism of the article quite uncalled for.

Our examination of the hydrastis was principally made last fall, and I then knew nothing of the analysis of Durand, further than stated in U. S. D., which concludes by saying, "He also discovered a peculiar nitrogenous crystallizable substance for which he proposes the provisional name 'Hydrastin,' until it shall be determined whether it be, as he suspects, an organic alkali." This is certainly very indefinite, and does not even make it certain which of the two alkaloid bases it was which he discovered.

On the 6th of Feb. last, when sending to Prof. Parrish some samples of xanthoxylum bark and other articles for the cabinet which the Pharmaciens of Philadelphia were getting up for exhibition at the World's Fair, I inclosed with them specimens of *Hydrastina* and *Mur. Hydrastia*, which we had obtained, and briefly mentioned their leading properties. These were placed in the College cabinet, and there, Mr. Editor, you had seen them so labelled, and refer to them in your note to the article of Dr. Mahla in the Journal of that month. You certainly must have forgotten this, when in your criticism of July, speaking of my report that, "the Hydrastis contains *two* distinct alkaloids, which we name Hydrastia and Hydrastina," you say "this assumption is to be discountenanced," because I did not acknowledge the analysis of Durand, and Mahla and Perrins, as previous discoveries. Mr. Durand had discovered but one of these bases, and that hypothetically, and Dr. Mahla's article, which had not then appeared, speaks of but one. The articles of J. Dyson Perrins indeed recognises two, but these were not published in London until the April and May following, and I had seen nothing of them until their appearance in the same number of your Journal with the extract of my letter to Prof. Parrish.

It is evident in regard to all of us that our investigations were entirely independent of the others, and thus far *Original*, whichever may be entitled to credit in point of time.

I certainly have no wish to arrogate to myself the merits of other men's skill or discoveries, although I may be remiss in keeping myself posted in regard to them. And lest I be again

accused of any such injustice, I beg leave here to state, I have not conducted these recent experiments alone. Fifteen years ago, I first introduced to the medical profession, the Podophyllin, Macortin, Leptandrin, and some others of that class of agents known as the "Resinoids" or "Concentrated remedies," and set the ball rolling in that direction. But the extensive mercantile and manufacturing business in which, in company with my brother, I became engaged, has since so engrossed my attention that I have found no time for the careful labors of chemical investigation and analysis. We have long felt, however, that many of that class of agents must be greatly improved and perfected by accurate and scientific analysis, or else be rejected from the list of medicinal agents, and have fully appreciated the wide field opened in vegetable materia medica, which, whatever may be our ability, we had no time to cultivate. We have, therefore, employed as an assistant in our laboratory, Prof. H. D. Garrison, a chemist of no mean acquirements, and while he works under our direction, and a good portion of the particular experiments and the steps pursued are at my suggestion, the *manipulations* are almost all performed and the results obtained by him.*

*Note by the Editor.—It seems needful to again refer to the subject of Mr. Merrill's paper, in order that we shall be fairly understood, both by the author and reader. The question at issue relates to the discovery of the active principles of the root of Hydrastis canadensis. In our July number, we published an extract of a letter to Mr. Parrish, with the authority of the writer, Mr. Merrill, and accompanied the paper with a critical note. In that paper Mr. Merrill spoke of the two alkaloids in the hydrastis, as though he had discovered them, and applies names to them as though they had not been written of before, he giving the commercial hydrastin the name of Durand's alkaloid, hydrastia; and calling the latter hydrastina; and it was to what we believed to be a disposition to ignore the labors of others that we applied the terms "this assumption is to be discountenanced." Mr. Merrill's explanations tend to modify this belief.

In the present paper, Mr. Merrill says, "It is evident in regard to all of us that our investigations were entirely independent of the others, whichever may be entitled to credit in point of time." "I certainly have no wish to arrogate to myself the merits of other men's skill or discoveries, although I may be remiss in keeping myself posted in regard to them."

Now we will not grant the position, that Mr. Merrill discovered either of the alkaloids, much less both of them, in the proper sense of making a discovery; nor can we admit Mr. Merrill's alleged ignorance of the details of Durand's paper, as an argument in his favor, in view of his knowledge of its existence near at hand, as he himself admits. In 1856, when sending out a collection of the American Materia Medica to Mr. Jacob Bell, for the Museum of the Pharmaceutial Society, we wrote to Mr. Wayne, of Cincinnati, for certain specimens not easily obtainable here. In his reply to my letter, Mr. Wayne, under date Cincinnati, May 23, 1856, says, . . . "I have sent you among the lot of specimens sanguinarina, sulphate of sanguinarina *hydrastin*, and *hydrastia*? I think the last *has all claims to be called an alkaloid*. The

In commencing our investigations, therefore, one of the first articles we took up was the hydrastis; and we thought we had acquired a pretty accurate knowledge of its constitution, and had briefly reported the result, when Prof. Parrish, in his letter of March 8th, acknowledging the receipt of the specimens, says: "The Hydrastina, and Muritate of 'Hydrastia', (Berberina,) and the salt of Sanguinarina are very acceptable, and are placed in the College cabinet, and adds, 'I suppose you have seen the late analysis of a Chicago chemist, transferred to the American Journal of Pharmacy for the current month. The specimen is as white as it can be made, *much more so than your pet specimen*, [alluding to a specimen of Durand's hydrastia in our cabinet, presented to us in 1851, and which we had shown him on a previous occasion]. I have a new process for obtaining *hydrastin*, at least I have seen no mention of it. I treat the coarse powdered root in cold water in a percolator. To the infusion I add an acid, generally muriatic acid, which throws down the hydrastin as a yellow powder, along with a pectin-like substance. . . . If the precipitate be now treated with boiling alcohol, only the hydrastin is taken up and crystallizes out upon cooling. By this process much less alcohol is lost than in the process of the Eclectic Disp. [Hill's process] and a much finer looking product obtained."

In regard to hydrastia, Mr. Wayne further says: "After I obtain the *hydrastin* from the cold infusion by an acid, I add to the acid liquor an alkali which precipitates a pale yellow powder, which being dried and treated with ether or alcohol, the hydrastia is taken up, and, upon evaporation, it is deposited in colored crystals, which by repeated solution and crystallization are obtained colorless."

Dr. John King, in the Eclectic Dispensatory, says, page 489—edit. 1859—in speaking of hydrastin (muriate of berberina:) "This elegant and highly valuable article was introduced to the profession by Dr. H. H. Hill, of the firm of F. D. Hill & Co., wholesale druggists in Cincinnati," and the process adopted by that gentleman is given in detail at page 480. By reference to the *advertising* sheet of the Eclectic Medical Journal for January, 1853, page 4, we find the following note attached to the name 'hydrastin' in a list of preparations advertised by F. D. Hill & Co., of Cincinnati, viz.: "This article, introduced by us one year ago, is one of the finest extant amongst Botanic medicines. In fact it is the quinine of North America." Hence Mr. Hill did not produce his Hydrastin until a year after Durand wrote, because Durand's Thesis was written in the summer of 1850—presented to the College at the session '50–'51, and of course not published till after the spring commencement in the latter year. Mr. Wayne's process is also given in that work, and nothing is said in reference to Mr. Merrill in that connection, albeit he was largely consulted by Dr. King in the compilation of his work. Our own impression had been that Durand's hydrastia was the only alkaloid in the hydrastis, and that the *hydrastin* of the Eclectic Dispensatory was the alkaloid of Durand, disguised by the yellow coloring matter of that author, [since shown to be berberina by Dr. Mahla], and the reader will find in the Pharmaceutical Journal, vol. 16th, November, 1856, page 269, and the following note that accompanied the sample of Eclectic hydrastin then sent to London: "*Hydrastin.* A small specimen of this principle, which is used by the Eclectics as a remedy, &c., &c. I believe the yellow color is mainly due to the adherent yellow resin or coloring matter, just as piperine is colored by the resine of pepper;" previous reference has been made to Durand's discovery of the alkaloid on the same page. From this it will be seen that at that time neither Mr. Wayne nor

whole subject of the proximate principles of the hydrastis requires further ventilation."

In fact, however, I have not seen the article of Dr. Mahla referred to, and the above word in parenthesis was the first intimation I had that the alkaloid I had named Hydrastia, was identical with berberina. The analysis of Mahla was not entirely satisfactory, and I immediately set about having this point further investigated.

From some brief experiments, too crude to be reported as a scientific analysis, I had a long time before satisfied myself

ourself had a correct notion of the nature of hydrastin. Subsequently to this —August, 1857—Mr. H. A. Tilden, of New Lebanon, sent us some samples of vegetable principles, and among them two labelled as follows: "Hydrastin," in silky crystals, and "Hydrastina alkaloid," a yellow amorphous powder. At that time we supposed it also was Durand's alkaloid, with yellow coloring matter, in a pulverized condition, but now, on trial, it is soluable in water to a considerable extent, coloring it yellow, and the solution restores the color of reddened litmus, and it is probably berberina.

Mr. Merrill's allusion to the specimens sent to Mr. Parrish, therefore, have nothing to do in deciding the case, as pure specimens of the same had been in our private cabinet for five years previously, as will be seen above.

It will be observed that Mr. Merrill recedes from his position in his former paper, that hydrastin is not berberina, he having been misled by the impurity of his sample of berberina.

We also wish to remark on Mr. Merrill's views in regard to the naming of those principles. He calls Durand's alkaloid Hydrastina, and the berberina alkaloid Hydrastia. We protest against this suggestion. Durand distinctly claims for his alkaloid (see page 117, vol. 23d, of the Amer. Journ. Pharm.,) if his assertion of its alkaline nature is corroborated, the name of *hydrastia*. Now, as *it* is the only peculiar alkaloid in hydrastis, it is entitled to that name, 1st, because it was given to it by Durand in 1851, and 2d, because it is the proper derivative for an alkaloid from the name hydrastis. Mr. Merrill argues because berberina is more abundant in the hydrastis than in other sources, it should be called hydrastia. This will not do, because berberina is found in at least four distinct drugs, and Columbo has equal claims. He also suggests "Xanthia" from its color. This is a beautiful name, and might have been appropriately used at first, but it is not probable that this name will be adopted, as M. Buchner, Sr. and Son, in 1835, describes this alkaloid in great detail, and gave it its present name, (see Journ. de Pharm, vol. xxi. page 408.).

Lastly, in justice to Mr. Durand, we wish to remove the impression conveyed in the paper of Mr. Merrill, that Durand's description of his alkaloid was very indefinite. So far from this being the case, he describes three distinct processes for obtaining it, proves its alkaline reaction, its crystalline form, its saturating power, its precipitability by tannic acid and ammonia, its total destructability by heat, and its nitrogenous nature. The only reason he hesitated to call it an alkaloid was the fact of its salts not crystallizing. Now, on this point Mr. Merrill says, it forms salts, "that are very soluable, and difficultly, if at all, crystallizable," and hence he corroborates Durand, and removes the only reason why he hesitated to call his product *hydrastia*. With these explanations of the past history of these principles, we are prepared to accord to Mr. Merrill and Prof. Garrison all credit due to them for their investigations of these principles in the pages which follow, as a valuable contribution to the knowledge of the subject.

that the yellow coloring principle of the xanthorhiza was the same as that of the berberis, but did not suspect their indentity with that of the hydrastis.

To determine this question, we prepared crystallized specimens of the muriate of berberina, and of our hydrastia, and subjected them to a series of comparative experiments, and these *then* led us to the conclusion, that although similar, they were not identical. Among these experiments were the following:

1st. Equal quantities of these muriates were dissolved in a dilute solution of potassa. That of hydrastia remained unchanged in color, whilst that of berberina became hyacinth red, and these colors remained at the end of five days.

2d. Equal portions were dissolved in equal quantities of boiling alcohol. On cooling, the muriate of hydrastia soon formed large stellar crystals, and when cold became semi-solid. The berberina solution when cold, showed only a cloud of extremely fine crystals. And as far as tried, this salt of berberina appeared more soluable in all cold menstrua, than that of the hydrastia.

3. To equal solutions in alcohol, tincture of iodine was added. In the hydrastia solution, large crystals soon appeared, and continued to form until the whole was a sold mass. Those under the microscope appear long, slender, and bright yellow. The berberina solution slowly evolved fine crystals, much less copiously, and these under microscope have a *brownish* hue.

The behavior with iodide of potassium was much the same, and the distinctions similar.

4. Equal solutions were treated with neutral acetate of lead. Both gave copious yellow precipitates, but that of the berberina appeared perfectly amphorous under the microscope (of 150 diam.) while that of the hydrastia was resolved into a mass of silky crystals.

Several other similar tests were applied, some of which showed no appreciable difference between the two salts, while in others differences were discovered that tended to confirm the conclusions drawn from the above, and named in our letter of June, viz.: that the two bases were not identical. We did not resort to ultimate analysis, for want of suitable apparatus.

We have not been able to repeat or extend these experiments for want of suitable material from which to prepare a better specimen of berberina. But we have since prepared the muriate of the alkaloid base of the xanthorhiza, of which we send you a sample labelled, "mur. *xanthia*," and this we have sat-

isfied ourselves is identical with that of the hydrastia, and this fact, together with the analysis of Mahla and Perrins, leads us to believe our experiments above stated to be delusive, in consequence of some imperfection in our preparation of the berberina, of which we had but a small quantity. Hence we admit the conclusion of Mr. Perrins, that the yellow coloring principle of the hydrastis, the berberis, and the xanthorhiza, are in all probability identical.

What then is the appropriate name of this beautiful alkaloid? The hydrastis is by far the most copious source, and that from which it will, no doubt, be chiefly obtained; and on this account should have the preference in giving it its name. Moreover, its salts will, without doubt, become important agents in the materia medica, and it is very desirable on this account that its name should point to the plant from which it is derived. These I think strong arguments, especially the latter, in favor of the name "Hydrastia," which I propose for it. On the other hand, the other alkaloid, which as yet is known to be found in this plant only, must naturally receive its name from it, and the similarity between the names hydrastia and hydrastina may lead to confusion and mistakes. It may also be considered partial to derive from one plant the name for a principle that is found in several. If these objections should be considered paramount, then I suggest for it the name *xanthia*, from the Greek xanthos, —yellow,—a most appropriate name, as it is the only alkaloid known of a bright yellow color.

But although this article is already sufficiently extended, I have not yet reported the processes by which we have obtained these preparations. These are in general indicated in the essays of Mahla and Perrins. But without going over the various experiments we have tried, and the possible processes that may be pursued, I will briefly state those which we have found most simple and elegible.

1st. The ground root may be exhausted, (and this is best done by percolation,) either by alcohol, dilute spirit, or even water.

If it is desired to obtain and preserve the dark resinoid principle which is abundant in the root, and is not without some medicinal value, then alcohol of ordinary strength must be used adding water at the last to drive out the spirit that it may be recovered. The alcohol must then be distilled off, and the resinoid, (which should be named hydrastin,) be allowed to settle and be removed and dried.

2d. To the clear solution, whether obtained by alcohol or

water, add hydrochloric acid, as long as a precipitate is formed, or until the liquid is distinctly sour.

This combines with both bases, but the muriate of hydrastia (or xanthia) being sparingly soluable in water, or cold alcohol, is precipitated as a bright yellow powder, and is collected and washed on a filter. A precipitate may be obtained by other acids, and by many salts, especially the muriates, but the most satisfactory results are by free muriatic aid. The impure muriate thus obtained is purified by dissolving it in hot alcohol, and treating it with animal charcoal, as described by others. The clear solution on cooling crystallises in beautiful acicular yellow crystals.

From this all the other salts are readily obtained by processes that will suggest themselves to every chemist. They mostly crystallize in needle-shaped or feathery crystals, and are all of a brilliant yellow color.

A little of the pure base *hydrastia* was obtained by withdrawing the acid from the sulphate of baryta, or what succeeded better in our hands, by oxide of lead. The pure alkaloid is uncrystallizable, but combines readily with the acids which we have presented to it.

The other alkaloid which we had named "hydrastin," is still in the mother liquor. From this it is precipitated in its basic condition by an alkali, say soda of ammonia, which combines with its organic acid, or the hydrochloric acid with which it is now combined, and let it fall as a greyish white powder, as it is wholly insoluable in cold aqueous fluids. This is purified by repeated solution in boiling alcohol, and crystallization from it on cooling. It crystallizes in large, quadrangular prisms, with very acute parymidal summits, and when pure are white or colorless. Although itself is quite insoluable in water, and is easily crystallized, it readily combines with all the acids, and forms salts that are very soluable, and difficultly, if at all, crystallizable: presenting in these respects exactly the reverse of the other alkaloid.

When the preservation of the resinoid principle is not desired, these alkaloids may be more economically obtained by exhausting the ground root with dilute sulphuric acid, instead of alcohol, as the sulphates of both of them are readily soluable, but the process is somewhat more circuitous and complicated, and I will not extend this already too long paper to describe it.

We have isolated the organic acid with which these bases are combined in their normal state, but not in sufficient quantity or purity to enable us to determine whether it be a distinct prin-

ciple, or is identical with some of the vegetable acids already known. If time permits we will investigate the matter farther.

Submitting these remarks, I remain, yours truly,

WM. S. MERRILL, A.M.

Cincinnati, August 25th, 1862.

EXPERIMENTAL RESEARCHES INTO A NEW EXCRETORY FUNCTION OF THE LIVER; CONSISTING IN THE REMOVAL OF CHOLESTERINE FROM THE BLOOD, AND ITS DISCHARGE FROM THE BODY IN THE FORM OF STERCORINE. (*The Seroline of Boudet.*)

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"*La Cholesterine du sang est elle un de ces produits destines a etre expulses de l'economie, et, par consequent, depourvus d'action immediate sur l'economie elle meme? Sa destination est tout a fait inconnue.*" Traite de Physiologie, par F. A. Longet. Paris, 1861. Tome i. p. 488.

This sentence, which was taken from the most elaborate treatise on physiology in any language, published in the centre of physiological science, in 1861, expresses the state of our knowledge with regard to the function of cholesterine. Cholesterine was discovered in 1782, by Poulletier de la Salle, in biliary calculi, and was detected upwards of thirty years ago, in the blood by Denis; but since then, with the exception of researches of a purely chemical nature into its properties, our knowledge with regard to it has not advanced. Its chemical history even, is far from perfect; while its physiological history is unknown. In 1833, Boudet discovered a substance in the blood which he called Seroline; a principle having many characters in common with cholesterine, but heretofore interesting merely as a curious proximate principle, found in excessively minute quantities in the serum of the blood only (whence its name); too minute, indeed, for ultimate analysis. Its function was as obscure as that of cholesterine. In examtning the literature of these two substances, we find that cholesterine is frequently not treated of in systematic works on physiology. Seroline is seldom even mentioned. Their function has been so obscure and apparently so unimportant, that theories with regard to it have not been advanced, and the highest chemical authorities, in

speaking of their office in the economy, simply say of one, as of the other, that it is unknown. In the *Chimie Anatomique*, by Robin and Verdeil, we find cholesterine summed up in these words:—

"*Le role physiologique qu'elle remplit dans l'economie est egalement inconnu.*"

Of Seroline, the same authors say:—

"*On ne sait pas comment se forme la seroline, ni quel est son role physiologique.*"

Though the physiology of these substances is thus obscure, though chemistry has thus far done little for their history, and physiology nothing, certain facts with relation to them would seem to indicate that they are not unimportant in the economy. Cholesterine is found in the blood, bile, liver, nervous matter, crystalline lens, neconium (not in the feces, as incorrectly stated by authors), besides in a number of morbid products. It is found in these situations *constantly;* it appears in the bloood as soon as that liquid is found, and continues till the end of life. Its quantity in the blood is increased in certain diseased conditions, and diminished in others. Seroline has been said to exist constantly in the blood, though, till now, it has never been discovered in any other situation. It, like cholesterine, is a constant principle, and having many chemical characters in common. Their function is definite; it is important; and, if the writer do not exaggerate this importance in the enthusiasm of exploring a hitherto absolutely uncultivated field, a knowledge of the functions of these substances will be of incalculable value to the practical physician; and the path thus opened by physiology will lead to a great field for pathological inquiry. *What the discovery of the function of urea has done for diseases which now come under the head of uremia, the discovery of the function of Cholesterine may do for the obscure diseases which may hereafter be classed under the head of Cholesteremia.*

It is not surprising that the function of substances—which have been isolated with great difficulty, *which have never been found in any of the excretions*, which exist in quantity so small, that their investigation seemed to belong especially to the chemist, physiologists having been discouraged, perhaps, from studying them—should be thus obscure. But it is surprising that that important fluid, the bile, the product of the largest gland in the economy, and one of the most constantly found in the animal scale, should be so little understood. This has been

regarded by some as a simple excrement, and by others as not an excrementitious, but a digestive fluid, and so much labor has been expended by physiologists in endeavours to settle this point, that no one has pretended to give an account of its excrementitious function, if it have any, and researches into its digestive function have left us almost entirely in the dark. Blondlot reported an observation on a dog which lived for five years with a biliary fistula diverting, as it is stated, all the bile from the intestines and discharging it from the body. The animal presented no untoward symptoms, died a natural death, no bile found its way into the intestines, but it was all discharged. According to this observation, the bile would appear to be purely an excrement, Schwann, and Bidder and Schmidt, in a large number of experiments, never succeeded in keeping a dog operated on in this way for more than a few weeks; they all died with evidences of inanition. The bile, according to these observations, is concerned chiefly in nutrition; and as it is poured into the upper part of the digestive tube, it is important, probably, in digestion. But Bidder and Schmidt do not satisfy us what its digestive function is; nor does Blondlot say what principle is excreted by it, nor what would be the result of its suppression.

Aside from a few facts, interesting enough, but indicating nothing definite, this is all we know of the function of the bile. But what physiologist does not feel this hiatus in his science; or what practical physician does not feel and know the importance of the function of the bile! It needs no inquiry into natural history, showing the universality, almost, of the liver in the animal scale, to impress upon the physician at the bedside the importance of the bile. A patient is suffering under an obscure ailment, which he may call biliousness or derangement of the liver, and which, in some unexplained way, is relieved by a mercurial purge. The practitioner knows that the bile-secreting function of the liver is important, but does not learn it from the physiologist. Every practitioner must feel that the liver has a function, which must be explained him by the physiologist, before he can avoid treating a large class of diseases empirically.

The bile has an important excretory function, which is liable to many disorders; and this function the writer hopes to be able, in the present article, to describe.

It will be seen by the preceding remarks that the physiological history of the bile remains to be written. The subject is too interesting and important not to engage the mind of the experimental physiologist. It is difficult at first sight to harmonize

statements, to which reference has just been made, of experimenters, equally entitled to consideration, which are diametrically opposed. But of course the philosophical method of studying the bile is first to settle whether it be excrementitious or recrementitious. If the former, what substance is excreted, and where is it formed? If the latter, what function does it perform in any of the processes of nutrition. With the view to harmonize, if possible, in my own mind, the opposite statements of Bidder and Schmidt, and Blondlot, I attempted some time ago to establish biliary fistulæ in dogs. The first experiments were made in New Orleans, in the winter of 1860–61; but were all of them unsuccessful, no animal surviving the operation more than three days. The experiments were discontinued at that time, but were renewed in the winter of 1861–62, at the Bellevue Hospital Medical College. After a number of trials, which were no more successful than those made the previous winter, I succeeded in performing the operation with considerable rapidity and with very little disturbance of the abdominal organs, and in one animal the success was complete.

Exp. 1. The operation was performed by making an incision into the abdomen in the median line just below the ensiform cartilage, about three inches in length. The edge of the liver was carefully raised, the bile duct isolated, and two ligatures applied, one next the duodenum and the other near the junction of the ductus choledochus with the cystic duct, the intermediate portion being excised. The fundus of the gall-bladder was then drawn to the upper part of the wound, an incision made in it of about an inch in length, the bile evacuated, and the edges attached to the skin by points of the interrupted suture. The wound was then carefully closed around the opening into the gall-bladder.

This is nearly the proceeding recommended by Blondlot, who prefers, however, to operate while the animal is fasting, as the gall-bladder is then distended and can be more easily found. I have preferred to operate after feeding, when the gall-bladder is comparatively empty, as there is no great difficulty in finding it, and in evacuating its contents less bile is apt to find its way into the peritoneal cavity, which is one of the causes of the intense peritonitis which follows this operation.

The animal ate well the day after the operation, the bile flowed freely from the fistula and was entirely cut off from the intestine, as shown by *post mortem* examination. No symptoms supervened except those produced by the diversion of the bile

from its normal course. This operation was performed on the 15th of November, 1861, and the animal lived thirty-eight days.

In no observation that I have found recorded has the animal been so free from inflammation consequent upon so serious an operation; and this seemed a most favorable opportunity of determining whether an animal could live with the bile shut off from the intestinal tube and discharged by a fistula. In this case the animal gradually lost flesh and strength, his appetite becoming voracious, until finally he died of inanition; the observation agreeing in every important particular with the experiments of Schwann, and Bidder and Schmidt.

Exp. 2. This experiment was undertaken to ascertain, if possible, the entire quantity of bile secreted in the twenty-four hours. A fistula was made into the ductus communis choledochus, the duct being divided and a silver tube introduced. The experiment did not succeed in point of view in which it was undertaken, and about forty-eight hours after the operation, the tube dropped out. After the removal of the tube the bile ceased to flow externally, and the animal did not appear to suffer any bad effects from the experiment. Thirty days after the operation, the animal having entirely recovered, he was killed by section of the medulla oblongata, and the parts carefully examined. The *post mortem* examination I transcribe from my note-book.

"On *post mortem* examination the liver was found adherent to the diaphragm over the greater part of its convex surface. There were evidences of limited inflammation over the duodenum. The liver itself was normal. Upon opening the duodenum, the papilla which marks the opening of the ductus communis choledochus was normal in appearance. A small silver stilet was introduced into the duct. *For a long time it was impossible to find any communication between the upper part of the duct and the intestine; but at last, after patient searching (knowing that no bile was discharged from the body, and that it was absolutely certain that a communication existed with the duodenum), a communication was found.* In Blondlot's case there probably was a communication re-established which escaped his observation."

In the remarkable observation reported by Blondlot, in which the animal survived for so long a period, the success is attributed to the fact that the dog was prevented from licking the bile as it flowed from the fistula, Blondlot stating that as soon as the animal was prevented from licking the bile, nutrition began to improve. Anxious to carry out all the precautions which had been

adopted, I so muzzled the animal in Exp. 1, covering the lower part of the muzzle with oiled silk, that it was impossible for him to swallow a drop of the bile. This muzzle was kept on till the death of the animal, but the proceeding had no effect on his nutrition. The bile flowed so freely from the fistula that all the lower part of the animal was covered with it. It was not, however, until I made the *post mortem* examination in the second experiment that I was able to see the difficulty which I had experienced in harmonizing the observations of the different experimenters I have quoted. In the lower animals—in dogs, at least—ducts have a remarkable tendency to re-establish themselves. Any one who has operated much upon the glands can hardly fail to have noticed this fact. The pancreatic duct, for example, after having been divided and a tube introduced, becomes invariably re-established after the simple removal or dropping out of the tube. It was so with Exp. 2, in which the tube dropped out of the bile duct. The duct undoubtedly became re-established, for no bile flowed externally for nearly a month, the animal enjoying perfect health, and the fluid necessarily being emptied into the intestine; yet it was with the greatest difficulty that the communication could be found with the probe, and it was only after a long searching, knowing that there must be communication, that it was discovered at all. Taking into consideration the great difficulty I had in finding the passage in this instance, and after having carefully examined the case reported by Blondlot, I have concluded that a communication existed in his experiment which escaped observation, but by means of which a large quantity of the bile found its way into the intestine.*

With regard to the digestive function of the bile, it is sufficient to state here that the experiments which I have made on this subject have led me to believe that this fluid has an important office in connection with the function of digestion—one, indeed, which is essential to life. The nature of its office, however, is not understood, and can only be settled by a long

* An account of this experiment is to be found in an article entitled "*Essai sur les Fonctions du Foi et de ses annexes par N. Blondlot.*" 1846. The *post mortem* examination of the animal, made more than five years after the establishment of the fistula, was published in a little memoir complementary to the preceding, entitled "*Inutilite de la Bile dans La Digestion.*" 1851. It was not contemplated to enter into a full discussion of the views of Blondlot and others on the uses of the bile in digestion. That subject will be taken up in another paper in which the digestive properties of the bile will be mainly considered. In this connection it is proposed to take up only the excrementitious function of the bile.

and carefully executed series of experimental researches which would probably involve the whole subject of digestion. This I hope to be able to present in another paper. There is, however, another function of the bile entirely distinct from the preceding. It is the separation from the blood of the cholesterine, an excrementitious substance, which is formed by the destructive assimilation of certain tissues of the body. Though not discharged from the body as cholesterine, it being first changed into another substance, it is separated in that form from the blood and poured into the intestine by the ductus communis choledochus. This new excretory function of the bile will form a great part of the subject of this paper; the recrementitious function, which is necessary to complete the physiological history of this fluid, being deferred.

We will find the cholesterine to be the most important excrement separated by the liver, as the urea is the most important one separated by the kidneys; and the study of this substance will necessarily involve the depurative function of the liver. I will therefore begin with the cholesterine, and endeavor to show where it is formed in the economy, by following the blood in its passage through various organs. This will necessarily involve a description of the chemical processes which have been employed in its extraction. I will then endeavor to show where the cholesterine is removed from the blood, by the same method of investigation. The next step will be to follow it out of the body, and study the change which it undergoes in its passage through the alimentary canal. Having described the process of formation in the tissues, separation from the blood by the liver, and final discharge from the body, I will endeavor to show, finally, the effects of interruption of this function of the liver upon the economy. This will lead us into pathology, and a host of diseases will arise which may be dependent on a disturbance of the excretory function of the liver. We will be enabled to draw the line more closely between conditions in which there is resorption simply of the innocuous coloring matter of the bile, and those diseases in which there is a failure to separate the excrements from the blood. These conditions, it is well known, are widely different as to gravity, and the distinction between them is of great importance. The latter condition, characterized by the retention of cholesterine in the blood, will be treated of under the name of *Cholesteremia.*

Cholesterine.

Chemical characters.—Cholesterine is a non-nitrogenized substance, having all the properties of the fats, excepting that of saponification with the alkalies. Its chemical formula is usually given as $C^{25}H^{22}O$. It belongs to a class of fatty substances which are non-saponifiable, which have been grouped by Lehmann under the name of lipoids. This class is composed of cholesterine and seroline, which are animal substances; castorine, from the *castoreum*, and amberin, from amber. To this he adds a substance discovered in a uterine tumor by Busch, called inosterine. Cholesterine is neutral, inodorous, crystallizable, insoluable in water, soluable in ether, very soluable in hot alcohol, though sparingly soluable in cold. It burns with a bright flame, but is not attacked by the alkalies, even after prolonged boiling. When treated with strong sulphuric acid, it strikes a peculiar red color, which is mentioned by some as characteristic of cholesterine. I have found that it possesses this character in common with seroline.*

Forms of its crystals.—Cholesterine may easily and certainly be recognized by the form of its crystals, the characters of which can be made out by means of the microscope. They are rectangular or rhomboidal, exceedingly thin and transparent, of variable size, with distinct and generally regular borders, and frequently arranged in layers with the borders of the lower ones showing through those which are superimposed. This arrangement of the crystals takes place when the cholesterine is present in considerable quantity. In pathological specimens they generally are few in number, and isolated. The plates of cholesterine are frequently marked by a cleavage at one corner, the lines running parallel to the borders; frequently they are broken, and the line of fracture is generally undulating. Lehmann attaches a great deal of importance to measurements of the angles of the rhomboid; according to this author, the obtuse angles are 100° 30′, and the acute 79° 30′. I have lately examined a great number of specimens of cholesterine, extracted from the blood, bile, brain, liver, and occurring in tumors, and am confident that the crystals have no definite angle. Frequently the plates are rectangular, and sometimes almost lozenge-shaped. It is by the transparency of the plates, the parallelism of their borders, and their tendency to break in parallel lines, that we recognize them as formed of cholesterine.

* This reaction of the seroline is mentioned by Berard, in the "*Cours de Physiologie*," tomme iii. p. 117.

Lehmann seems to consider the tablets of this substance as regular crystals, having invariable angles. From examination during crystallization, I am disposed to think that they are not crystals, but fragments of micaceous sheets, which, from their extreme tenuity, are easily broken. In examining a specimen from the meconium, which I extracted with hot alcohol, I was able to see a transparent film forming on the surface of the alcohol soon after it cooled; this, on microscopic examination, *in situ*, disturbing the fluid as little as possible, was found to be marked by long parallel lines. When the fluid had partially evaporated, it became broken and took the form of the ordinary crystals of cholesterine, but they were larger and more regular. The beauty of the tablets at this stage could not be adequately represented. They were exceedingly thin, and regularly divided into delicate plates, with the characteristic corner cleavages of the cholesterine; and, as the focus of the instrument was changed, new layers, with different arrangement, were brought into view. I have attempted to give an idea of the form of these tablets in Fig. 1; but it is, of course, impossible to represent their pale, but beautifully distinct borders. As has been remarked by Robin, the borders of these crystals can but be imperfectly imitated by a line; there is no line in the object itself, but the edge shows where the tablet ceases. (See Fig. 1.)

The crystals are generally colorless, but when present in colored fluids, may take a yellowish tint, or even become very dark. They may still be recognized, however, by the characters of form just described.

Crystals of cholesterine melt at 293° Fahr., but are formed again when the temperature falls below that point. According to Lehmann, they may be distilled *in vacuo* at 680° without decomposition. The determination of the fusing point is one of the means of distinguishing it from seroline, which fuses at 90° 8′.

Situation of the Cholesterine.—Most authors state that the cholesterine is found in the bile, blood, liver, brain, and nerves, crystalline lens, meconium, and the fecal matter. I have found the cholesterine in all these situations invariably, excepting the feces, where it was seen but once after a number of examinations; and in studying the works of those who have investigated this substance, I can find no one who has found it in the normal feces. It is found in large quantities in the meconium, from which, perhaps, it is most easily extracted in a state of purity, and has been extracted from the feces of animals in a state of hibernation; but though it may occasionally be found in the feces

in disease, and in animals after long fasting, I am confident that it never occurs in the ordinary conditions. The analysis of the fecal matter is so unattractive, that it has been very much neglected by chemists; and until a few years ago, when an elaborate analysis was made by Marcet, to which reference will hereafter be made, the analysis of Berzelius formed nearly all our data on this subject. Cholesterine forms the greater part of biliary calculi, which indeed consists generally of nothing but cholesterine, coloring matter, and mucus. It is found in a large number of morbid deposits. Few cases of cancer are examined without discovering tablets of cholesterine. It is very abundant in encysted tumors. According to Robin, atheromatous deposits, which are found in the middle coats of the arteries, are often composed of cholesterine. It sometimes forms distinct tumors or deposits in the substance of the brain. I lately had an opportunity of examining a tumor from the brain, at the Bellevue Hospital, which consisted of nearly pure cholesterine. It has often been found in a fluid of hydrocele, in the fluid of ovarian cysts, in crude tubercle, in epithelial tumors, and in pus. The proportion in which it exists in the fluids of the body is very small. I have made a number of quantitative analysis of the blood, the results of which I give in the following table, with some of the analysis which have been made for this substance. I also give the quantity which I have found in the other situations in which it is found. The variations in different parts of the circulation and in diseased conditions will be given in another table. The quantity in the brain and crystalline lens has, I believe, never before been estimated:—

Table of Quantity of Cholesterine in various Situations.

Situation.	Observer.	Quantity examined.	Cholesterine per 1,000 pts.
Venous blood (male)	Becquerel and Rodier.		0.090
Do. (female)	Becquerel and Rodier.	*grains.*	0.090
Do. (male æt. 35.)	A. Flint, Jr.	312.083	0.445
Do. (male æt. 22.)	A. Flint, Jr.	187.843	0.658
Do. (male æt. 24.)	A. Flint, Jr.	102.680	0.751
Bile (human)	Frerichs.		1.600
Do. (normal of ox)	Berzelius.		1.000
Do. (human)	A. Flint, Jr.	224.588	0.618
Meconium.	Simon.		160.000
Do.	A. Flint, Jr.	170.541	6.245
Brain (human)	A. Flint, Jr.	159.753	7.729
Do. do.	A. Flint, Jr.	150.881	11.456
Crystalline lens (ox)*	A. Flint, Jr.	135.020	0.907

* In this examination four fresh crystalline lenses of the ox were used.

Form under which the cholesterine exists in the organism.—In the fluids of the body cholesterine exists in a state of solution, but by virtue of what constituents it is held in solution, is not entirely settled. It is stated that the biliary salts have the power of holding it in solution in the bile, and that the small amount of fatty acids which are contained in the blood hold it in solution in that fluid, but direct experiments on this point are wanting. In the nervous substance and in the crystalline lens it is united "*molecule a molecule*" to the other elements which go to make up these tissues. After it is discharged into the intestinal canal, when it is not changed into stercorine, it is to be found in a crystalline form, as in the meconium, and in the feces of animals in a state of hibernation. In pathological fluids and in tumors, it is found in a crystalline form, and may be detected by microscopic examination.

Process for the extraction of cholesterine.—Without describing the processes which have been employed by other observers for the extraction of cholesterine from the blood, bile, and various tissues of the body, I will confine myself to a description of the process which I have found most convenient to employ in the analysis I have made for this substance. In analysis of gall-stones the process is very simple; all that is necessary being to pulverize the mass, and extract it with boiling alcohol; filter the solution while hot, the cholesterine being deposited on cooling. If the crystals be colored, they must be redissolved, and filtered through animal charcoal. This is the proceeding employed by Poulletier de la Salle, Fourcroy, and Chevreul. It is only when this substance is mixed with fatty matters, that its isolation is a matter of any difficulty. In extracting cholesterine from the blood, I have operated on both the serum and clot, and in this way have been able to demonstrate it in greater quantities in this fluid than has been observed by others, who employed only the serum. The following is the process for quantitative analysis, which I determined upon after a number of experiments.

The blood, bile, or brain, as the case may be, is first carefully weighed, then evaporated to dryness over a water bath, and carefully pulverized in an agate mortar, so as to collect every particle. The powder is then treated with ether, in the proportion of about a fluidounce for every hundred grains of the original weight, for from twelve to twenty-four hours, agitating the mixture occasionally. The ether is then separated by filtration, throwing a little fresh ether on the filter so as to wash through every trace of the fat, and the solution set aside to evapo-

rate.* If the fluid, especially the blood, have been carefully dried and pulverized, when the ether is added it divides into a very fine powder, and penetrates every part. After the ether has evaporated, the residue is extracted with boiling alcohol, in the proportion of about a fluidrachm for every hundred grains of the original weight of the specimen, filtered, while hot, into a watch-glass, and allowed to evaporate spontaneously. To keep the fluid hot while filtering, the whole apparatus may be placed in the chamber of a large water-bath, or, as the filteration is generally rapid, the funnel may be warmed by plunging it into hot water, or steaming it, taking care that it be carefully wiped. We now have the cholesterine mixed with a certain kind of saponifiable fat. After the fluid has evaporated, we can see the cholesterine crystallized in the watch-glass, mingled with masses of fat. This we remove by saponification with an alkali; and for this purpose, we add a moderately strong solution of caustic potash, which we allow to remain in contact with the residue for from one to two hours. If much fat be present, it is best to subject the mixture to a temperature a little below the boiling point; but in analysis of the blood, this is not necessary. The mixture is then to be largely diluted with distilled water, thrown upon a small filter, and thoroughly washed till the solution which passes through is neutral. We then dry the filter, and fill it up with ether, which, in passing through, dissolves out the cholesterine. The ether is then evaporated, the residue extracted with boiling alcohol, as before, the alcohol collected on a watch-glass, previously weighed, and allowed to evaporate, The residue consists of pure cholesterine, the quantity of which may be estimated by weight.

The accuracy of this process may be tested by means of the microscope. As the crystals have so distinctive a form under the microscope, it is easy to determine by examining the watch-glass, whether it has been obtained in a state of purity. In making this analysis quantitatively, it is necessary to be very careful in all the manipulations; and for determining the weight of such minute quantities, an accurate and delicate balance, one, at least, that will turn with the thousandth of a gramme, carefully adjusted, must be employed. With these precautions, the quantity of cholesterine in any fluid or solid may be determined with perfect accuracy. The quantity of cholesterine may be estimated in from fifteen to twenty grains of blood. In analyzing the brain and bile, I found it necessary to pass the first

* The ether may be preserved by distillation, instead of allowing it to evaporate, but the small quantity usually employed this is hardly worth while.

ethereal solution through animal charcoal, to get rid of the coloring matter. In doing this, the charcoal must be washed with fresh ether till the solution which passes through is brought up to the original quantity. The other manipulations are the same as in examinations of the blood. In examining the meconium, I found that the cholesterine which crystallized from the first alcoholic extract was so pure that it was not necessary to subject it to the action of an alkali.

I am aware that in describing the process for the extraction of cholesterine I have entered into details which would be superfluous for the practical chemist. But the extraction of this substance from the blood is so simple, and the results of the examination of the blood in different parts of the circulatory system have been so striking and important, that I cannot but indulge the hope that the observations which follow will be verified by those who may not be skilful practical chemists. Almost any one is competent to make a quantitative analysis of the blood for cholesterine. It simply requires six days for the process, and a number of analysis may be carried on at the same time. It requires one day, after the blood his been dried and pulverized, for the ether to act upon it; the next morning it is filtered and set aside; the next morning it will be dry, and may be extracted with alcohol, and set aside to evaporate; the next morning it may be treated with potash, filtered, and the filter washed with water; the following day it may be washed with ether, and set aside to evaporate; the following day it will have evaporated, and may be extracted with hot alcohol; and the following day the alcohol will have evaporated, and the specimen may be examined by the microscope and weighed. All that is required is a little care in the performance of these manipulations—which one with a slight acquaintance with operations in chemistry may perform at once, and one or two trials will enable a novice to execute—and accuracy in weighing, which is, indeed, the most delicate part of the process.

History of cholesterine.—A brief sketch of the history of this substance may not be uninteresting. It was first obtained by Poulletier de la Salle, in 1782, who extracted it from a biliary calculus. He communicated his observations to Fourcroy, who published them, after having verified his experiments, the death of the discoverer preventing him from making his observations public. Afterwards, in examining an old, hardened, liver, Fourcroy found a concrete, oily substance, analagous to that discovered by Poulletier. He imagined that the liver had become changed into a substance resembling spermaceti. The

cholesterine was afterwards found in gall-stones, by Vicq d' Azyr, by Jaquin, Titus, and Kreysig. In 1791, Fourcroy described a substance which he called adipocire, found in bodies at the *cimetiere des Innocents*, which he likened to spermaceti and to cholesterine. He always, however, made a distinction between these substances; calling the cholesterine *crystallizable adipocire.* In 1814, Chevreul established the difference between the adipocire and the cholesterine, giving a full description of the cholesterine. He extracted it from the bile of the human subject, of the bear, and of the pig.

After that time a number of chemists found it in the gall-stones and intestinal concretions. Lassaigne found it in a cerebral tumor, Guerard in hydatid cysts of the liver, Morin in the liquid from an abdominal tumor, Caventou in the matter from an abscess under the malar bone, and a number of others in tumors in various situations. In 1830, it was discovered in the blood by Denis, and afterwards described by Boudet, who wrote an elaborate article on the composition of the serum of the blood in 1833, in which he describes the cholesterine and a new substance which he called *seroline.** It was also detected in normal blood by Lecanu and Marchand. Couerbe, who made elaborate researches into the chemical composition of the cerebral substance, pointed out the existence of cholesterine in the brain. Lebert found it in the substance of cancerous tumors, Curling found it in the fluid of hydrocele, Simon extracted it from the meconium, and Preuss discovered it in the substance of crude tubercle. Of late authors, Becquerel and Rodier have been most extended in their investigation of this principle.† They have made a number of careful quantitative analysis of the blood for this substance in health and disease. Their observations will be more particularly referred to further on.‡

[*Continued in the next Number.*]

* Boudet, Nouvelles Recherches sur la composition du serum du sang humain. Annales du Chimie et de Physique, tom. lii, p. 337.

† Traite de Chimie Pathologique appliquee a la medecin pratique, par M. Alf. Becquerel, professeur agrege, etc., et par M. A. Rodier, Docteur en Medecine, etc. Paris, 1854, and Recherches sur la composition du sang. Paris, 1844.

‡ The history of the cholesterine was mostly compiled from the excellent work of Robin and Verdeil, the Chimie Anatomique.

POISONING FROM THE YELLOW TIGER LILY.

Oct. 27th.—*Case of poisoning from the Pollen of the common yellow Tiger Lily.*—Dr. Jeffries Wyman read the following report of a case by Dr. R. T. Warren, of Waltham, Mass.

"Mrs. B. was making a call at a neighbor's, having with her a little daughter, 4 years old. The child was 'perfectly well,' the mother said, and had been so. It played with another little girl, and did not go out of the room during the call. The little girl came to Mrs. B., requesting her to go and see Fanny, the name of the child. Mrs. B. went, and found Fanny rubbing her nose very violently. Soon there was a profuse discharge of mucus from the nose, colored yellow. The mother questioned the child, and ascertained that she had reached her hand out of the window, taken an anther from a tiger lily, and passed it into the right nostril. The child pointed out the lily, and the mother found just one anther missing. Mrs. B. was particular in her inquiries, and the child was positive in stating what she had done. Vomiting soon followed the discharge of mucus from the nose. This consisted at first of chyme, having no appearance of undigested food, and was followed by vomiting of mucus, colored yellow, the same as the discharge from the nose. The child then wanted to go to sleep. The mother took her home, and then sent for me. I saw her at 6, P. M., Wednesday, August 13, about an hour after the anther was passed into the nose. The child appeared sleepy, but was easily roused, and was intelligent. Vomiting of mucus, tinged yellow, occurred while I was present. The yellowness did not seem to be caused by bile. The symptoms did not seem at all alarming. Not aware that the tiger lily possessed any poisonous properties, I felt no anxiety, and went away, after prescribing remedies, requesting to be called if anything new occurred. I was sent for about 10, P.M., four hours afterwards. Evacuations of the bowels had occurred; at first of natural appearance, then followed discharges colored yellow, the same as the vomiting and the discharge from the nose, and at last bloody discharges. The vomiting had occurred occasionally, and this at last became bloody. The child was dull, sleepy, and languid. I prescribed astringents, opiates in the form of paregoric, and brandy and water, if the languor should increase. I saw her on Thursday morning. A dejection, quite bloody, occurred between 1 and 2 o'clock, A.M., and after that the dejections were checked. She was relieved of the vomiting. The child seemed languid, rather sleepy; no wandering. The eyes had a dull, reddish injection. At 4, P.M., same

day, appearance of the child much the same as in the morning. The right nostril was nearly closed; membrane of both nostrils very pale. Some discharge of clear, thin mucus. Friday morning.—The child looked brighter. Same reddish injection of the eyes. No urine had been passed during the last twenty-four hours. Slight feverish symptoms. No delirium. 7, P.M., Friday.—No urine had been passed. Several dejections, dark colored, very offensive. Some fever during the day, slight delirium and startings. Some nausea. Was called to her about 1 o'clock, Saturday morning. Shortly before she had a large, dark-colored, very offensive discharge, and immediately began to sink. She died a little before 4 o'clock, about fifty-nine hours after passing the anther into the nostril."—*Boston Journal.*

NARCOTICS.

By JOSEPH BATES, M.D.

ATROPA BELLADONNA.

Whooping-Cough.—Dr. Stille remarks "although previously employed in the treatment of this disease, belladonna was first systematically used to cure wooping-cough, by Schæffer and Wetzler, in 1810; the latter treated thirty children, all of whom were cured, between the eighth and fifteenth day after beginning to take the medicine. He found the most favorable period of the disease for commencing the treatment was between the sixteenth and twentieth days, and the proper dose to be a quarter of a grain of the root, morning and evening, for a child under one year of age. These results were confirmed by many writers, and particularly by Meglin, and by Kahleiss, in 1827. Several years later, Dr. Samuel Jackson, then of Northumberland, Pa., prescribed the remedy in numerous cases of whooping-cough, and with complete success, directing fractional parts of a grain of the extract at intervals of three hours, until dilatation of the pupil took place, when the medicine was ommitted altogether, or given in smaller doses. This treatment was preceded by antiphlogistic measures. Constant, in presenting a summary of his observations, at the Children's Hospital, in Paris, in regard to the treatment of whooping-cough, gives preference to belladonna over all other means; and his report shows substantial ground for this preference, inasmuch as the progress and decline of the disease corresponded with the suspension and resumption

of the remedy. Dr. Thompson, of London, bears a similar testimony upon this subject. M. Fuster, Professor in the University of Montpellier, employed vapors of an infusion of belladonna leaves by inhalation, and with uniform success." Dr. Corson, of Norristown, Pa., says: "During the last seventeen years, I have given the extract of belladonna to hundreds of patients, from ten months to fifty years of age, and am firmly convinced that it has a greater control over whooping-cough than any other remedy in common use." Many observers have found it almost inefficacious, (says Stille) at the commencement of an epidemic, but very successful during its decline. So Ingmann states, that under such circumstances, it far surpasses all other medicines. M. M. Rilliet and Barthez do not appear to have used it, but call attention to the fact that Wendt and Gœlis have both seen mischievous consequences result from its use. Stille says: "No other writers allude to such effects, except as following an injudicious exhibition of the medicine, or the omission to suspend it when dilatation of the pupil comes on; even these disquieting symptoms are stated to have been temporary."

Bretonneau advised to be administered to a child of five years old, immediately before breakfast for two days, a pill containing one-twelfth of a grain of the extract; if no effect is observed by the third day, he raises the dose to one-eighth of a grain. He advises on the fifth day the same dose, and on the eighth day, if no effects are produced, one-third of a grain may be given, and continued for three days, or gradually increased until the pupils are effected, or the cough declines; at that point the dose should, for a time, remain the same. M. Trousseau remarks that insomnia is apt to be produced by belladonna in this disease, and he usually gives opium in combination with it. Cases of whooping-cough are reported, which were distinctly palliated when this drug was taken, and aggravated when withheld. On the whole, says Dr. Stille, it would appear that belladonna is positively curative in whooping-cough which has passed the inflammatory stage, but that in certain epidemics, it has signally failed, in the hands even of those who have before prescribed it with success. "The practitioner should be careful to watch its effects, lest they become alarming to the patient's family, or inflict even temporary mischief."

Belladonna, applied to a blistered surface, has been promptly and completely efficient in some cases of laryngitis, which were more or less of a spasmodic character.

Braithwaite's Retrospect, Part 42, p. 98, contains an article on the successful treatment of whooping-cough, by increasing

doses of sulphate of zinc and extract of belladonna, by Dr. Fuller, physician to St. George's Hospital.—[In the *Medico-Chirurgical Transactions*, Dr. Fuller publishes a paper on the tolerance of belladonna by children. The following abstract of a paper read before the Harveian Society of London, contains a sufficient epitome of that article.] Dr. Fuller commenced his paper by calling attention to the commonly received opinion, as stated in most books on the subject, that, "Whooping-cough must run a certain course." He combatted this opinion by reference to the results of his own experience, and then proceeded to point out the causes which had led to its general adoption. Among these he mentioned the inefficiency of the treatment ordinarily employed, and the neglect of all measures likely to subdue the tendency to spasm on which the continuance of the whoop depends. Dr. Fuller regarded the complaint as consisting essentially of bronchitic irritation, usually not very severe, accompanied by reflex spasm of the air-passages, and expressed his opinion that in most cases the spasmodic symptoms are those which demand our most serious attention. Not only is the spasm a most painful symptom, but is one which may give rise to life-long mischief. His object, therefore, had always been to subdue the spasm as speedily as possible, and the practice which, until the last twelve months, he had found most successful for the purpose, was the administration of sulphate of zinc in rapidly increasing doses. (This Part was published in 1861.)

Dr. Fuller then referred to the discovery he had made as to the tolerance of belladonna by children, which is recorded in a paper published in the *Medico-Chirurgical Transactions*, and he briefly stated the facts which are there detailed in *extenso*, as to the amount of belladonna which may be given with safety, and the conditions which should be observed in its administration. The conditions he specified were, first, the remedy should be given at least four times daily, and should be administered at first in small doses, which may be increased day by day, or on alternate days, by a corresponding amount. He pointed out that mere dilatation of the pupils need not be regarded as a bar to its administration, and stated that if the precautions just referred to are observed, the daily dose of the extract of belladonna may be safely increased up to a scruple, or half a dram, without the production of any unpleasant symptoms. He then proceeded to state that he had brought these facts to bear on the treatment of whooping-cough, and from the conjoint use of sulphate of zinc and extract of belladonna, in rapidly increasing doses, had obtained results exceeding his most sanguine

expectations. Rarely had he found the whoop to last above twenty-one days, and in some instances it had subsided in ten days. The mode in which Dr. F. proceeds, is to give the zinc and belladonna as soon as the whoop declares itself. If the attack is accompanied by much febrile excitement, and bronchitis, and irritation, he prescribes a cough-drop containing a dram of antimonial wine and a dram of ipecacuanha wine to two ounces of water, and, if necessary, applies a blister to the chest. Of the cough-drop a larger or smaller amount is given, according to circumstances. To children under three years of age, he usually begins by giving one-sixth of a grain of belladonna, and half a grain of sulphate of zinc, four times daily; and to children above that age one-quarter of a grain of extract of belladonna and a grain of sulphate of zinc. These remedies are given in a solution in water, and the dose of each substance is increased by a corresponding dose daily, or on alternate days; so that the child by taking one-quarter of a grain of the extract and one grain of the zinc, at a dose, would be taking one grain of the extract and four grains of the zinc at a dose, either on the fourth, the sixth, or the eighth day, according to the rapidity with which the dose is increased. Dr. F. concluded by citing cases illustrative of the value of this treatment; assured the members of its safety, and urged its general adoption.

In *Braithwaite's Retrospect*, Part 21, p. 141, M. Debregne has a paper on this subject. He says, "belladonna has been eminently useful in the epidemics of whooping-cough which he has observed; but the success attending its administration depends on the observance of the following rules. The dose of belladonna should be proportioned to the number of months representing the child's age; and the quantity to be taken in twelve days, (the ordinary duration of treatment,) will be five centigrammes (three-fourths of an English grain) multiplied by the number of months. Thus, for an infant six months old, the dose will be thirty centigrammes (four and a-half grains) in twelve days; for one of two years and a-half, the dose will be one and a-half gramme (twenty-three grains) in the same period. For children above six years of age, the quantity of three grammes (forty-six and one-third grains) is not exceeded. The medicine is always given three times in the day. For instance, the prescription for a child three years old would be powder of the root of belladonna, two grammes; to be divided equally into twelve powders, of which one is to be given daily, in three divided doses. If there be vomiting, it should be given immediately after a fit of vomiting and coughing. Recourse should

not be had to this remedy, until the inflammatory element has been overcome by leeches, emetics, etc.; in other words, it is not to be employed before the tenth or fifteenth day, when the cough will have assumed its specific character.

Dysmenorrhœa.—Dr. Golden Bird found this agent very efficacious when there was no organic disease of the uterus, but shreds were discharged at the menstrual period, and severe pain was experienced at the same time in the hypogastric region. When the patient is anæmic or leucophlegmatic, one-fourth of a grain of extract of belladonna with one grain of sulphate of zinc may be given every two or three hours until the pain ceases. For plethoric patients ipecacuanha is more suitable than the sulphate of zinc. Between the catamenial epochs, purgatives should be administered, and other means taken to improve the general health. Bretonneau employed this remedy topically under similar circumstances. Dr. G. Bird's paper on dysmenorrhœa treated with belladonna was published in the *London Medical Times*, also in the *Boston Med. and Surg. Journal*, Vol. 30, p. 282. Dr. B. says in cases where the pain is seated over the region of the uterus, in the lower part of the abdomen, he has given the belladonna internally, taking care that the extract is properly prepared, and has invariably found it successful; great relief is experienced at the next menstrual period; greater still at the succeeding one, and a cure is finally accomplished. By removing (says Dr. Bird,) the irritable condition of the uterus, and curing the dysmenorrhœa, the pseudo-pleurisies and pseudo-peritonitis, for which bleedings were formerly, unfortunately, so largely practiced, will soon get well. The cases in which the pain is seated chiefly in the loins, do not yield to the employment of belladonna. This, Dr. Bird considered was owing to congestion of the uterus. Fortunately (he says) the cases that are most remarkable are the most frequent.

Dr. Walker (as stated in the *Lancet*, March 23, 1844, p. 27,) has found belladonna alone, both externally and internally, in cases of dysmenorrhœa to afford temporary relief. He applies it externally in the form of a plaster of the simple extract spread on adhesive plaster.

He has seen the belladonna in conjunction with hydrocyanic acid, in the proportion of one-quarter to half a grain of the extract to three minims of Scheele's preparation, four or five times a day, of great benefit in cases of severe gastrodynia.

Constipation.—Trousseau declares belladonna to be the remedy par excellence for habitual constipation. It does not purge

nor produce loose stools, but only renders defecation easier, and sometimes in the dose of a quarter of a grain the extract will produce several stools. As soon as the bowels become regular the dose of the medicine should be gradually diminished Cases illustrative of the efficacy of this treatment are reported by Fiessenger, who, however, made use of suppositories containing the extract of belladonna, by Blacke, and by Flewry. (Stille).

Copland recommends small doses of belladonna in alvine obstructions (p. 477).

Strangulated Hernia.—In truly spasmodic affections, or those in which there is abnormal, and, for the most part, paroxysmal muscular contraction, belladonna has been extensively and beneficially employed. David reports two cases in which the internal use of belladonna led to the reduction of strangulated hernia, which seemed to demand an operation. He gave half a grain of the extract every half hour. In one case three, and in the other four doses were taken.

In the *Gazette Hebdomaire*, there is reported a case of inguinal hernia, which was relieved after taxis had failed, by the administration of the extract of belladonna, in three or four grain doses every half hour. The tincture of belladonna was also employed locally by means of a flax-seed poultice.

In the same journal there is also a report of a case in which belladonna was administered, with very great relief to the patient. In this there was no protrusion of the bowel, but, from the symptoms, obstinate constipation, great pain, stercoraceous vomiting, etc., it was evident that there was complete occlusion of the bowel. The belladonna in this case was employed after an operation for artificial anus had been decided upon. The remedy was used in the form of an ointment, by friction; and as soon as complete intoxication was induced its good effects were preceptible.

American Journal, Vol. 15th, p., 533: Dr. Frankel has successfully treated six cases of strangulated hernia, with the extract of belladonna. Five of these cases were crural hernia in females. The sixth was an umbilical hernia.

The author was called upon to visit a boy some ten years of age, July 8th, 1862; found the little patient in great distress; and upon examination of the abdomen readily discovered the cause of his distress, which was inguinal hernia. I made every endeavor to reduce it, but failed in accomplishing it. I then made an ointment of belladonna and lard, equal parts, and spread a small plaster, and applied it to the hernial tumor, and waited its results. In less than half an hour my patient became

quiet and easy; and his pupils some dilated. I then directed my attention to the hernia, and found a spontaneous reduction. The plaster was immediately removed, and the surface cleansed with tepid water; nevertheless the pupils remained dilated for twenty-four hours.

Rigidity of the os uteri during labor.—It was first recommended to overcome this condition by Chaussier. He as well as several other writers have testified to its virtues in overcoming this annoying incident of parturition.

This condition of the os uteri may readily be controlled by an ointment made of belladonna and lard, and with the finger apply it immediately to the mouth of the uterus.

In the *American Med. Monthly*, may be found a paper of B. F. Barker's on belladonna shortening labor. Dr. Barker gives a table of 147 cases of labor, in which this remedy had been used for dilating the os externum by comparatively painless contractions. The extract was administered in quarter-grain doses, two or three times daily, commencing about two weeks previous to the close of gestation.

Plethoric patients took tartar emetic with belladonna—three grains of the former, eight of the latter, in two ounces of syrup of orange peel (one ounce of the tincture of orange peel, and one ounce of water), a teaspoonful three times a day. With some the following formula was used: compound tincture of cinchona, three ounces; syrup, one ounce; ext. of belladonna, eight grains. Other combinations for special indications. A very great difference appeared in the susceptibility of patients to the influence of the agent, owing to the difference in the purity and strength of the article. One would seem to have double the potency of another, without any corresponding difference in the appearance, color, or odor. In some cases the dose had to be diminished, but in most instances it could be gradually doubled, or even tripled. Dryness of the throat, slight uneasiness or giddiness of the head, dimness of the vision, are indications to diminish the dose. Not one of the children was still-born, and in none of the cases was there post-partum hæmorrhage or retention of the placenta. In one the function of lactation was entirely absent; in two others the mammary secretion did not appear until the fifth day.

The following cases are mentioned in the *Boston Medical and Surgical Journal*, Vol. 30, p. 502:—"Premature delivery. Six and a-half months gone. Called twelve hours after birth of fœtus, to deliver placenta. Placenta adherent. Uterus collapsed upon the same. Could not dilate the os tincæ with my

finger. Used the ungt. belladonna to the os and neck; in thirty minutes the uterus was dilatable. Delivered with the blunt hook. Patient had a quick recovery."

Another:—"Protracted labor; rigidity of the os tincæ; alarming hiccough and vomiting, with sudden cessation of expulsive pains. The slightest touch of the finger to the os, or pressure of the child from change of position, would induce the hiccough and increase the vomiting. Applied the ungt. to the os tincæ. In five minutes the hiccough ceased, the vomiting soon followed, the rigidity relaxed, and the patient fell into a quiet sleep. With the aid of savin and ergot, in an hour and a-half the patient was delivered."

The author, R. P. Stevens, closes by stating that in his materia medica there is not a more potent drug than the atropa belladonna.

Laryngitis.—Dr. Stille says that belladonna applied to a blistered surface, appears to have been promptly and completely efficient in some cases of laryngitis which displayed more or less of a spasmodic element; and as an internal remedy for nervous coughs, especially for those which, independently of any local disease of the respiratory apparatus, disturb the rest at night by their persistence and violence.

Richard Hughes (Surgeon to the Brighton Orthopædic Hospital,) has a publication on the influence of belladonna on the pneumogastric nerve, in *Braithwaite*, part 42, p. 296. He closes his able communication as follows:—"The practical results from the above facts will be, that we shall be led rationally to the use of belladonna and its congeners in all affections of the pneumogastric nerve. Laryngismus stridulus must, therefore, be added to the above mentioned morbid conditions. I have lately used belladonna (in combination with nitric acid) in every case of common cough which has come under my notice, and with far more marked success than I have obtained from any other remedy. I trust that a more extended trial may add fresh support to the view thus advocated."

Tetanus.—Dr. Hutchinson has reported many cases of traumatic tetanus, as cured by the extract of belladonna. Dr. H. reports that the specific action of the medicine upon the pupils was followed by an abatement of the spasms, but this was not until the dose was increased from half a grain or a grain of the extract every three hours, to four grains every two hours. It was then gradually diminished. The treatment continued about one month.—(*Am. Jour. of Med. Sci.*, Apr. 1858, p. 340.)

Vial mentions three cases of cure by this agent, and Ernest

reports others. Belladonna is said to have cured idiopathic form of tetanus. The following case is taken from the *Gazette Medicale;*—published also in *Braithwaite's Retrospect*, Part 22, p. 90.

"M. Bresse, surgeon at the Military Hospital at Rennes, proposed, in 1848, the treatment of traumatic tetanus by the application of tincture of belladonna, and reported a case, in which it had been successfully employed in the *Gazette Medicale de Paris*, of Sept. 30, 1848. M. Bresse has now placed on record another case, which has come under his notice. The patient, one of the Garde Mobile, received a wound on the 20th of March; tetanic symptoms appeared on the 5th of April. Frictions of belladonna were commenced on the 5th, and by the 12th the patient was out of danger. Imprudently exposing himself to cold, the tetanic symptoms returned in the muscles of the back, but were quickly removed by again having recourse to frictions. The tincture employed was composed of five parts of extract to eleven of alcohol, and was applied all over the body, and more particularly over the rigid parts. M. Bresse adds, that another practitioner has arrested trismus, which he feared would proceed to general tetanus, by the same means."

From the same work, Part 39, p. 315, a short notice is taken from *Med. Times and Gazette*, April, 1854: "Belladonna may be given in large doses, in tetanus. Give one grain every two hours, and increase this dose to one and a-half grains, using occasionally a suppository with three grains in it. Watch the pupil; if it dilate, gradually desist from the belladonna.

From the same work, Part 10, p. 29: "In tetanus larger doses of belladonna are endured and required for its relief than in cases of neuralgia. The enormous dose of five grains of the extract of belladonna was successfully administered in one case, and in another the dose was gradually increased, until eventually four grains were given, and repeated every two hours. In this case, after a certain quantity of the medicine had been administered for a certain time, the system appeared to acquire a tolerance of it, and, from this point of improvement the symptoms remained stationary until an increased quantity was administered, when speedily a manifest advancement again took place, and this continued for a certain period, until a larger dose was again demanded, in order still further to influence the disorder. This course was very well marked and positive, and this it was which encouraged and induced Dr. H. still further to increase the dose of belladonna, until eventually the tetanus was entirely subdued."—*Journal of Materia Medica.*

ON THE VALUE OF URINARY ANALYSIS IN THE DIAGNOSIS AND TREATMENT OF HEPATIC DISEASE.

By GEORGE HARLEY, M.D., Professor in University College, London.

The author began by saying that, as the practice of medicine is simplified in direct proportion as our means of "physical diagnosis" increase, he was glad to have the opportunity of calling attention to the fact that a knowledge of the condition of the urine is of as great assistance in the diagonsis of affections of the liver as of those of the kidney. Hitherto, the only physical means we possessed of detecting and distingushing the various forms of hepatic disease did not extend beyond the acquiring a knowledge of the position and size of the liver by percussion, the absence of bile from the stools by inspection, and the presence of biliary pigment in the urine by the application of nitric acid to that secretion. Every one, however, must have met with cases of obscure hepatic disease where these means of research proved totally inadequate to their requirements. This circumstance has led several practitioners to seek further aids to diagnosis in such cases; and consequently, at various times during the last few years, valuable suggestions have fallen from different members of our profession both here and abroad. For example, Dr. Eiselt, of Prague, has called attention to the fact that in cases of melanotic cancer of the liver, the true nature of the affection may be sometimes discovered during life by the presence of melanine in the patient's urine. (A specimen was shown to the members of the Association.) Urine containing melanine, the author said, although of the normal color when first passed, gradually becomes of a dark hue, even as dark as porter, when left for some hours exposed to the air. This change appears to be the result of a slow oxidating of the pigment. In the second place, Frerichs, in his admirable treatise on Diseases of the Liver, states that two substances, tyrosine and leucine, which were formerly only known to the scientific chemist, are invariably to be found in the urine of patients laboring under acute or yellow atrophy of the liver. Dr. Harley said he had been able to verify this statement in the urine of a young married woman who died from this most fatal form of disease. Dr. Wilks, he stated, had brought the case under the notice of the Pathological Society, and a report of it would be found in the "Transactions." Dr. Harley mentioned an interesting case of chronic atrophy of the liver, the result of obstruction from dis-

ease of the pancreas, in the urine of which he found both tyrosine and leucine. He had seen the gentleman several times along with Mr. Prance, and they noticed that as the disease advanced the quantity of the abnormal ingredients increased. After death, crystals of tyrosine were found in the liver. Dr. Harley recommended that in all cases of obscure hepatic disease these substances should be looked for; and said that in the majority of cases they were readily detected in the concentrated urine by means of the microscope. The tyrosine appears as needles and little stars; the leucine as round yellow balls, some of which are occasionally spiculated.

The author next proceeded to direct attention to the method he had recently laid before the profession of distingushing between jaundice arising from suppression and jaundice the result of obstruction—two forms of disease so ably described by Dr. Budd. As the treatment of jaundice from suppression ought to be very different from that adopted in jaundice from obstruction, it is of essential importance to be able to distinguish the one from the other. After alluding to the great differences of opinion that have hitherto existed regarding the presence of the biliary acids in the renal secretion in cases of hepatic disease, the author pointed out how the discrepancies arose from the fact that sufficient attention had not been paid to the kind of jaundice under which the patient labored. He said he believed that where bile acids occurred in the urine in any quantity, their presence might be regarded as a certain sign of the existence of some obstruction in the course or at the termination of the common bile duct. Dr. Harley then proceeded to demonstrate, by experiment, how easy it is to detect the bile acids in the urine by means of strong sulphuric acid and a small piece of white sugar. The sulphuric acid was so added as not to mix with the urine; the sugar floated at their line of contact, and after some minutes assumed a purple hue. In the urine containing no bile acids the sugar was simply browned.

Dr. Thudichum said, the author had ascribed the doctrine he had propounded to Prof. Frerichs. He, however, only watched the patients clinically; it was another physiologist who made the examinations, and discovered tyrosine and leucine. The disease in question was dogmatically termed atrophy, but he (Dr. Thudichum) as dogmatically objected to that term, for he had seen cases where the liver was certainly enlarged about one-third its ordinary size; and in one case, brought under his notice by Dr. Richardson, it was double in size. In some cases, so far from the liver being atrophied, it was hypertrophied. An ex-

cellent test was to put a drachm of the solution of the nitrate of mercury to the urine; the urine being then boiled, the white precipitate produced would be transformed into a dark purple color, and the solution itself would assume a partly purple color. —*London Lancet.*

PRESERVATION OF ANIMAL FOOD.

To the Editor of the Lancet,

SIR:—Knowing the avidity with which you seek information upon subjects having for their object the general good, and more especially if that subject is dependent upon chemical scientific researches, I am induced to go out of my usual course by forwarding this letter on the important subject of the preservation of animal food in its uncooked state.

I was invited a few days since, by Mr. Richard Jones, of Botolph-lane, City, to inspect his specimens of uncooked preserved joints of meat. A simple statement of facts will explain more fully the nature of this application of science to the requirements of man than any description of mine will convey. I was shown several hundred tins containing hams and bacon, hermetically sealed, from which the whole of the air had been extracted, and the vessel filled with a non-decomposing element, to be shipped for consumption to India, China, and other tropical climates. It will, doubtless, be said that nothing is more simple than to preserve that which has been already cured by salting; at all events, the success attending this branch of the business paved the way for more astonishing results, for in consequence of the perfectly-preserved state of this mildly-cured animal substances, it was determined to try the same means upon fresh *uncooked* meat. The various specimens inspected are a proof of the superiority of this method over every other that has been hitherto brought under the notice of the public.

It appears that Mr. Jones has been engaged on his investigation into this subject for several years. He, from the onset, felt satisfied that if means could be adopted by which every pound of meat should have its given quantity of preservative gas, and the vessel containing the meat could be deprived of the whole of its oxygen, the result must be an entire absence of decomposition. Such a theory put into practice is entirely confirmed by results. As a proof, there are a large number of tins containing beef, legs of mutton, fowls, sausages, fish, &c., all of which have been there for months, put to every test of temperature, yet remain

perfectly free from decomposition. It was found by experience that tin, although the most convenient vessel, had its objection, and it was determined to place the material to be acted upon in earthenware pans or jars. The result was most satisfactory; the meat could not be distinguished, either before or after cooking, from that just obtained from the butcher's, although encased for several months previously. Such was the success attending the placing it in earthenware that Mr. Jones determined to expose the meat thus preserved under glass shades for the Exhibition. For this purpose he merely secured a fresh leg of mutton to a porcelain fish strainer, and fastened this to a small board, into which were screwed some tin stands; these were soldered to a tin-plate bottom, which was again soldered to a rim of tin, which had been previously secured to the bottom of the glass shade by means of hot-cement. The air was then withdrawn from the inside of the shade, a non-decomposing gas introduced, and the aperture sealed up. The apparatus arranged to carry out this purpose protects the fragile glass, whatever may be the amount of atmospheric pressure. During this operation the glass becomes dim in consequence of the deposit of vapor from the meat upon the inside of the glass; yet the contents are distinctly visible, neither increasing, diminishing, or changing their natural appearance.

These are now in the eastern annex of the International Exhibition. Several of these glass shades, containing beef, mutton, fowls, pigeons, salmon, soles, &c., are well worthy the inspection of our naval, military, and hospital surgeons. Who knows but that meat now allowed to rot in the Brazils and other distant countries for want of means of preserving it, may be brought to this country, and be a cheap food for our over-crowded population! There is a large field open to inquiry, and we have only now arrived at the beginning of large results. From looking at the specimens of animal food, I am led to think that similar means applied to the preservation of pathological and anatomical specimens would add much to the beauty of our museums.

I am, Sir, yours respectfully,

SAMUEL AINSWORTH, F.L.S., &c.

Villa Mont Blanc, Spring-grove, Sept., 1862.

—*London Lancet.*

THE ASTLEY COOPER PRIZE.—This prize, of 1500 dollars, has been awarded to Dr. Edward Crisp, by the physicians and surgeons of Guy's Hospital, for his essay on the Anatomy, Physiology, and Pathology of the Human Pancreas.

Book Notices.

THE HOSPITAL STEWARD'S MANUAL; FOR THE INSTRUCTION OF HOSPITAL STEWARDS, WARD-MASTERS, AND ATTENDANTS, IN THEIR SEVERAL DUTIES. Prepared in strict accordance with existing regulations and the customs of service in the Armies of the United States of America; and rendered authoritative by order of the Surgeon-General. By JOSEPH JANVIER WOODWARD, M.D., Assistant-Surgeon U.S.A., Member of the Academy of Natural Sciences of Philadelphia, &c. Philadelphia: J. B. LIPPINCOTT & Co. 1862.

This is an excellent little manual of 324 small-sized octavo pages, containing just what its title indicates. It is printed on good paper, in fair type, and should be in the hands of all the Hospital Stewards, Nurses, and many of the Surgeons of the Army.

For sale at the Bookstore of S. C. GRIGGS & Co., 41 Lake Street, Chicago.

ANATOMY OF THE ARTERIES OF THE HUMAN BODY, DESCRIPTIVE AND SURGICAL, WITH THE DESCRIPTIVE ANATOMY OF THE HEART. By JOHN HATCH POWER, M.D., Fellow, and Member of Council, of the Royal College of Surgeons; Professor of Descriptive and Practical Anatomy, in the Royal College of Surgeons; Surgeon to the City of Dublin Hospital, &c. Authorized and Adopted by the Surgeon-General of the United States Army, for use in Field and General Hospitals. Philadelphia: J. B. LIPPINCOTT & Co. 1862.

This is a small-sized octavo volume of 401 pages; printed on good paper, and excellent type. We have not had time to examine in detail the merits of this work. But it is, doubtless, accurate; and from its moderate size, and numerous cuts, it will be found a very convenient work for reference by the army surgeon, who is often deprived of all access to ordinary libraries.

For sale by S. C. GRIGGS & Co., 41 Lake Street, Chicago.

PHYSICIAN'S VISITING LIST, FOR 1863. Published by LINDSAY & BLAKESTON, of Philadelphia.

Its contents are: an Almanac, a table of Signs, Marshall Hall's ready method in Asphyxia, Poisons and their Antidotes, Table for calculating the period of Utero-Gestation, Blank leaves for visiting lists, Memoranda, Addresses of Patients and others, Accounts asked for, Memoranda of Wants, Obstetric engagements, Vaccination engagements, &c.

Editorial.

N. Y. Ophthalmic School.—Dr. Mark Stephenson delivered the Introductory to his *Eleventh Course* of Lectures on Diseases of the Eye, at the New York Ophthalmic Hospital, cor. 4th Av. and 28th Street, on the 24th ult., to a large and attentive audience, composed of physicians and medical pupils from the several medical schools in the city.

He commenced by welcoming the students to the N. Y. Ophthalmic Hospital, and added he was happy to announce to them that the Institution, in whose behalf he appeared, was never in a more prosperous condition than at the present, averaging a thousand patients per annum, and numbering over three hundred graduates since its organization in 1852. 85 of whom were M.D.'s. After describing the requisite qualifications and duties of a surgeon, he cautioned them against attempting to make a display in their operations before a gaping crowd, for the purpose of exciting and dazzling an audience by the rapidity of their manipulations, as is too often apparent in some of our amphitheatres. He then drew an impressive contrast between the mere operator and the scientific and skilful surgeon.

Spoke next of the eye, anatomically and pathologically—of its organization and delicacy of structure, transcending all that is wonderful in design and admirable in execution.

That as the eye or its appendages were composed of all the different tissues which enter into the composition of the human frame, so its diseases were more numerous than that of any other organ in the body; also the effect of treatment, whether operative or otherwise, was more satisfactory than that of any other class of diseases, from the fact that there are so many objective symptoms; contrasted the treatment of former times, when Thompson's eye water was the sovereign remedy, with the enlightened and scientific methods of the present day, proving clearly that no department of medical literature had made greater strides in modern days than ophthalmic medicine and surgery. He endeavored to impress upon the minds of his hearers the importance of attending to this department of the

profession; especially those intending to practice in the country, where adequate counsel is difficult to be obtained. Hence the importance of their availing themselves of the untold advantages to be derived from attending the cliniques and lectures of an ophthalmic school; that this branch of the profession may no longer be suffered to fall into the hands of empirics and charlatans, to the disgrace of regular practitioners. The time had now come when the stigma should be wiped from the profession, and no longer rest as a reproach upon surgeons, in the middle of the nineteenth century. Every medical man, claiming to be an accomplished physician and surgeon, should be well acquainted with ophthalmic medicine and surgery; urged them not to despond in view of the vastness of the undertaking; what others had accomplished and overcome they might.

He finally closed by saying: "Gentlemen, think nobly of your profession. Remember that its end is *beneficent*, its studies *ennobling and elevating*, its ministration an exercise of your best faculties. To excel in it is worthy of all your aspirations and energies; but requiring mental and moral discipline, patient and persevering labor. Make of your difficulties a school in which strength of character may be tried. There is no sweeter reminiscence than that of difficulties overcome. Cultivate a love of knowledge, for the benefit it will enable you to confer upon others, then what ever worldly fortune betide, you will win the most valuable of all blessings which the occupation of a life can confer, accomplish the will of your Maker and live to His glory."

Illinois State Medical Society.—Shall we have a meeting of the State Medical Society at the regular time next May? Two regular annual meetings have been postponed, on account of the continuance of civil war, and the large number of members absent with our volunteer army; and we raise the question in relation to a further postponement thus early, to elicit from those interested, a free expression of opinion.

It cannot be denied, that repeated postponements are apt to terminate in the permanent dissolution of all voluntary social

organizations. Hence all who desire a continuance of our State organization should favor the holding of the next meeting at the appropriate time. Jacksonville, the place selected for the next meeting, is an attractive locality. Several interesting and important State institutions are located there, and will be accessible to the members of the Society. We trust the meeting will not only be held, but that it will be largely attended also, by delegates from all parts of the State.

CHICAGO MEDICAL SOCIETY.—The regular meetings of this Society are held on Friday evening of each week, in Larmon's Block, on the corner of Clark and Washington Streets. They are well attended, and the exercises interesting and profitable.

APPOINTMENT.—The Governor has filled a vacancy in the Board of Medical Examiners for this State, by the appointment of DANIEL BRAINARD, M.D., Professor of Surgery in Rush Medical College.

CHICAGO MEDICAL SOCIETY.—Nov. 7, 1862.

Regular monthly Meeting. Dr. WICKERSHAM in the chair. Minutes of last meeting read and approved.

Dr. TUCKER exhibited a large pedunculated tumor, fibro-polypoid in character, which he had removed from the posterior and left side of the cavity of the neck of the uterus. The tumor had existed 18 years. A few days since, the patient was attacked with severe expulsive pains, when the tumor was suddenly forced from the uterus, and remained suspended from the vulva. Dr. TUCKER was called for the purpose, as the patient stated, of having her womb replaced. An examination revealed the true nature of the tumor, which was cut away, after the pedicle had been ligated.

Dr. TUCKER also related the case of a woman æt. 32, to whom he was called in her third confiement. He found a child delivered and dead; the placenta lying in the vagina and mouth of the uterus. Upon placing one hand on the abdomen, he

could distinctly feel a round, hard body like the uterus partially contracted as after delivery; he could also feel another child lying above the umbilicus across the abdomen. On passing the hand into the vagina, to remove the placenta, two distinct and separate mouths of the uterus were discovered; one large, from which the placenta was removed, and the other smaller and closed. The woman recovered in the usual length of time, the ordinary discharge of lochia occurring. More than two months have elapsed since the first birth took place; the second and remaining child continues to develop, and will probably be delivered in about six weeks.

Dr. HOLMES moved that Dr. TUCKER be requested to visit the patient from time to time, and to report the result at some future time.

Dr. HOLMES reported the case of a cyst, which he had removed from the breast of a young woman, 17 years of age. The only point of particular interest in the case consisted in the peculiar form of the cyst, which was about an inch long, and a-third of an inch in diameter, and penetrated deep into the gland.

Dr. HATCH opened the discussion on Scarlatina anginosa, followed by Drs. HOLMES, TUCKER, WAITE, DAVIS, PAOLI, and PETERSON.

It was voted that the meetings of the Society be held every Friday evening, through the winter and spring.

Question for discussion at next meeting—CAMP DIARRHŒA.

Adjourned. E. L. HOLMES, *Sec'y.*

AFFECTIONS OF THE THROAT IN SCOTLAND. — Sore-throat, ulcerated sore-throat, and diphtheria, have occurred in various localities in Scotland, and in Mid and South Yell. The sore-throat appears to have been accompanied with an affection of the hands, which raises the suspicion that sore-throat and diphtheria in the human subject is but a variety of the epidemic disease in cattle known by the name of murrain or epizootic aptha, characterized by the aphthous and ulcerated mouth and sore hoofs.

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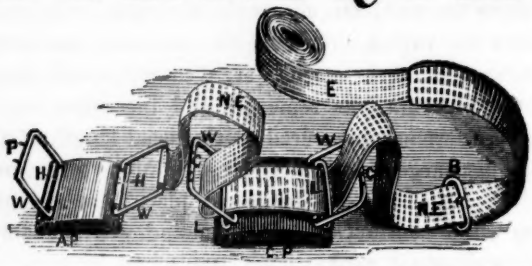

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